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Agenda Item: 5.2.3

Source: T2

Title: CR 23.040-028rev1 Rel-5 “Extended Objects in EMS”

Document for: Approval

Spec	CR	Rev	Rel	Subject	Cat	Vers-Curr	Vers-New	T2 Tdoc	Workitem
23.040	028	1	rel-5	Extended Objects in EMS	B	4.2.0	5.0.0		TEI5

CR-Form-v3

CHANGE REQUEST

⌘ **23.040** **CR** **028** ⌘ rev **1** ⌘ Current version: **4.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Extended Objects in EMS
Source:	⌘	Alcatel, Ericsson, Motorola, Magic 4, Swapcom, One2one, Hutchison 3G, Vodafone, France Telecom, Siemens
Work item code:	⌘	TEI5
Date:	⌘	4 June 2001
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Extension of EMS
Summary of change:	⌘	This CR proposes to extend the EMS with a framework allowing: - an extended range of format types that can be refered to in EMS messages. - large objects to be incorporated in EMS messages.
Consequences if not approved:	⌘	
Clauses affected:	⌘	
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	None

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3GPP TS 23.040 V4.2.0 (2001-03)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Terminals;
Technical realization of the Short Message Service (SMS);
(Release 4)

Keywords
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2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TS 01.04: "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2] 3GPP TS 02.03: "Digital cellular telecommunication system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] 3GPP TS 22.004: "General on supplementary services".

[4] 3GPP TS 22.041: "Operator determined barring".

[5] 3GPP TS 43.002: "Digital cellular telecommunication system (Phase 2+); Network architecture".

[6] 3GPP TS 23.008: "Organization of subscriber data".

[7] 3GPP TS 23.011: "Technical realization of supplementary services - General Aspects".

[8] 3GPP TS 23.015: "Technical realization of Operator Determined Barring (ODB)".

[9] 3GPP TS 23.038: "Alphabets and language-specific information".

[10] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".

[11] 3GPP TS 43.047: "Digital cellular telecommunication system; Example protocol stacks for interconnecting Service Centre(s) (SC) and Mobile-services Switching Centre(s) (MSC)".

[12] 3GPP TS 44.008: "Digital cellular telecommunication system (Phase 2+); Mobile radio interface layer 3 specification".

[13] 3GPP TS 24.011: "Short Message Service (SMS) support on mobile radio interface".

[14] 3GPP TS 27.005: "Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[15] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[16] 3GPP TS 51.011: "Digital cellular telecommunication system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM- ME) interface".

[17] CCITT Recommendation E.164 (Blue Book): "Numbering plan for the ISDN era".

[18] CCITT Recommendation E.163 (Blue Book): "Numbering plan for the international telephone service".

[19] CCITT Recommendation Q.771: "Specifications of Signalling System No.7; Functional description of transaction capabilities".

[20] CCITT Recommendation T.100 (Blue Book): "International information exchange for interactive videotex".

[21] CCITT Recommendation T.101 (Blue Book): "International interworking for videotex services".

[22] CCITT Recommendation X.121 (Blue Book): "International numbering plan for public data networks".

[23] CCITT Recommendation X.400 (Blue Book): "Message handling system and service overview".

[24] ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (USC); UCS2, 16 bit coding".

[25] 3GPP TS 22.022: "Personalization of GSM ME Mobile functionality specification - Stage 1".

[26] 3GPP TS 23.042: "Compression Algorithm for Text Messaging Services".

[27] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[28] 3GPP TS 43.048: "Digital cellular telecommunications system (Phase 2+); Security Mechanisms for the SIM application toolkit; Stage 2".

[29] 3GPP TR 21.905: "3G Vocabulary".

[30] 3GPP TS 31.102: "Characteristics of the USIM application".

[31] 3GPP TS 31.101: "UICC – Terminal interface; Physical and logical characteristics".

[32] 3GPP TS 22.105: "Services and Service Capabilites".

[33] Infrared Data Association. Specifications for Ir Mobile Communications (IrMC). iMelody

[34] IETF RFC 822: "Standard for the format of ARPA Internet text messages".

[35] IETF RFC 1951: " Deflate Compressed Data Format Specification"

[36] vCard - The Electronic Business Card", version 2.1,The Internet Mail Consortium (IMC), September 18, 1996, URL:http://www.imc.org/pdi/vcard-21.doc

[37] vCalendar - the Electronic Calendaring and Scheduling Format", version 1.0, The Internet Mail Consortium (IMC), September 18, 1996, URL:http://www.imc.org/pdi/vcal-10.doc

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3.9 SMS COMPRESSION

Short Messages may be compressed in accordance with the compression algorithm described in 3GPP TS 23.042 [26].

Compression and Decompression may take place between SME's or between an SME and the SC.

The compression only applies to the TP-User-Data part of the TPDU and excludes any TP-User-Data-Header which may be present. The Compression Header (see 3GPP TS 23.042 [26]) must commence at the first octet of the TP-User-Data field immediately following any TP-User-Data-Header field which may be present.

The TP-UDL value must be set in accordance with that value defined for the compressed TP-User-Data case in subclause 9.2.3.16.

The TP-DCS parameter indicates whether or not a short message is compressed. If the TP-DCS parameter indicates that the short message is compressed then the alphabet encoding values (bits 2 and 3 in 3GPP TS 23.038 [9]) must be ignored by the receiving entity.

In the case where a short message after compression is greater than 140 octets (including the Compression Header and Footer (see 3GPP TS 23.042 [26]) and any TP-User-Data-Header which may be present) then the sending entity must concatenate the short message in the normal way as described in subclause 9.2.3.24.1 if it wishes to continue to send the short message. Only the first segment of the concatenated short message must contain the Compression Header defined in 3GPP TS 23.042 [26]. All segments other than the final segment must be 140 octets in length. Only the final segment contains the Compression Footer (see 3GPP TS 23.042 [26]).

For mobile terminated compressed messages, where the MMI or the Message Class indicated in the TP-DCS requires the message to be stored in the MS then the MS shall store the compressed message as received. In the case where the MS is capable of decompression then the MS may display the decompressed message. Such an MS may optionally store the message in decompressed form subject to the MS being configured to do this via MMI. However, prior to storing the message in decompressed form, the MS may have to create a concatenated SM and carry out component modification on the TP-UDL and TP-DCS values to indicate the correct length values and that the message is no longer compressed. Transfer of messages direct from the radio interface or those stored in the MS to a TE is according to the procedure defined in 3GPP TS 27.005 [14] and is independent of whether the message is compressed or uncompressed.

For mobile originated compressed messages, an MS capable of compression may compress a short message generated within the MS itself prior to sending it to the radio interface. An MS capable of compression may optionally compress an uncompressed message received from a TE subject to the MS being configured to do this via MMI. In such a case the MS would have to carry out component modification on the TP-UDL and TP-DCS values to indicate the correct length values and that the message is compressed. A TE may send a message (compressed or uncompressed) to the MS using the procedures defined in 3GPP TS 27.005 [14]. The MS shall store the compressed message as received and/or transfer it directly to the radio interface.

In addition for the compression method described above, it may be possible to compress certain Information Elements of the User Data Header of a TPDU. The compression method is defined in Section 9.2.3.24.10.1.13.

3.10 Enhanced Messaging Service

The Enhanced Messaging Service (EMS) is based upon the standard SMS, but with formatting added to the text. The formatting may permit~~s~~ the message to contain ~~simple~~ animations, ~~small~~ pictures, ~~small~~ melodies~~, and~~ formatted~~ing of the~~ text, and vCard and vCalendar objects. Objects may be ~~everything~~ mixed together into one message. This section ~~lists~~ overviews the supported features. The coding mechanisms and formats are specified in subclause 9.2.3.24.10

The following sub sections describe a number of features of EMS. The data formats in the features below shall be supported (ie the UE shall behave in a predictable manner when receiving such data) but the features are supported subject to the capabilities of the UE. However, it is highly recommended that all of these features are implemented otherwise interoperability problems at the application level may result.

3.10.1 Text formatting

The following text formatting features are supported:

Alignment

- Left ~~(default)~~
- Centre
- Right

Font size

- Normal ~~(default)~~
- Large
- Small

Style

- Normal ~~(default)~~
- **Bold**
- *Italic*
- Underlined
- ~~Strikethrough~~

3.10.2 Pictures

Basic Pictures

It is possible to include either a small (16*16 pixels), large (32*32 pixels) or pictures of variable size. These pictures have neither animation nor grey scales~~;~~, ~~it is~~they are plain black and white. All pictures are user defined. ~~If multiple pictures are received side by side, then they will be stitched together with no inter-character spacing. If a <CR> is inserted in the middle of multiple pictures, then the left margin of the pictures are vertically aligned. If two pictures that are of the same size are logically separate, they should be separated by a space or other characters.~~
~~Maximum recommended pictures size usage of this technique: 96x64 (6 large pictures, with a CR in the middle). This unified picture is then formatted as one.~~

Extended Pictures

It is possible to include extended pictures. These pictures may be black and white, greyscale or colour bit maps. The picture size is a maximum of 255 x 255 pixels. These pictures may be transmitted in a compressed form.

3.10.3 Animations

Predefined

There are number of predefined animations. These animations are not sent as animation over the air interface, only the identification of them. As soon as the position of the animation in the SM data is reached, the animation corresponding to the received number shall be displayed in a manner which is manufacturer specific.

User Defined

The user-defined animations consist of 4 pictures and there are two different sizes of these animations. The picture size of the small animations are 8*8 pixels and the large 16*16 pixels. These animations are sent over the air interface.

Extended Animations

It is possible to include extended animations. These may be black and white, greyscale or colour bit maps. The maximum size of a single animated frame is 255 x 255 pixels. The repetition of these animations may be controlled by the originator. These animations may be transmitted in a compressed form.

3.10.4 Sound

Predefined

There are a number of predefined sounds. These sounds are not transferred over the air interface, only the identification of them. There are 10 different sounds that can be added in the message, and as soon as the sound mark is in focus (on the display), the sound will be played.

User Defined

The sender can define own melodies according to the iMelody format [33]. These melodies are transferred in the SM and can take up to 128 bytes.

Extended Sounds

Monophonic melodies may be transferred using the iMelody format [33]. These may be transmitted in a compressed form.

3.10.5 vCard and vCalendar

A message may contain vCard and vCalendar objects as specified in [36][37]. These may be transmitted in a compressed form.

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9.2.3.24 TP-User Data (TP-UD)

The length of the TP-User-Data field is defined in the PDU's of the SM-TL (see subclause 9.2.2).

The TP-User-Data field may comprise just the short message itself or a Header in addition to the short message depending upon the setting of TP-UDHI.

Where the TP-UDHI value is set to 0 the TP-User-Data field comprises the short message only, where the user data can be 7 bit (default alphabet) data, 8 bit data, or 16 bit (UCS2 [24]) data.

Where the TP-UDHI value is set to 1 the first octets of the TP-User-Data field contains a Header in the following order starting at the first octet of the TP-User-Data field.

Irrespective of whether any part of the User Data Header is ignored or discarded, the MS shall always store the entire TPDU exactly as received.

FIELD	LENGTH
Length of User Data Header	1 octet
Information-Element-Identifier "A"	1 octet
Length of Information-Element "A"	1 octet
Information-Element "A" Data	1 to "n" octets
Information-Element-Identifier "B"	1 octet
Length of Information-Element "B"	1 octet
Information-Element "B" Data	1 to "n" octets
Information-Element-Identifier "n"	1 octet
Length of Information-Element "n"	1 octet
Information-Element "n" Data	1 to "n" octets

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for uncompressed GSM 7 bit default alphabet data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

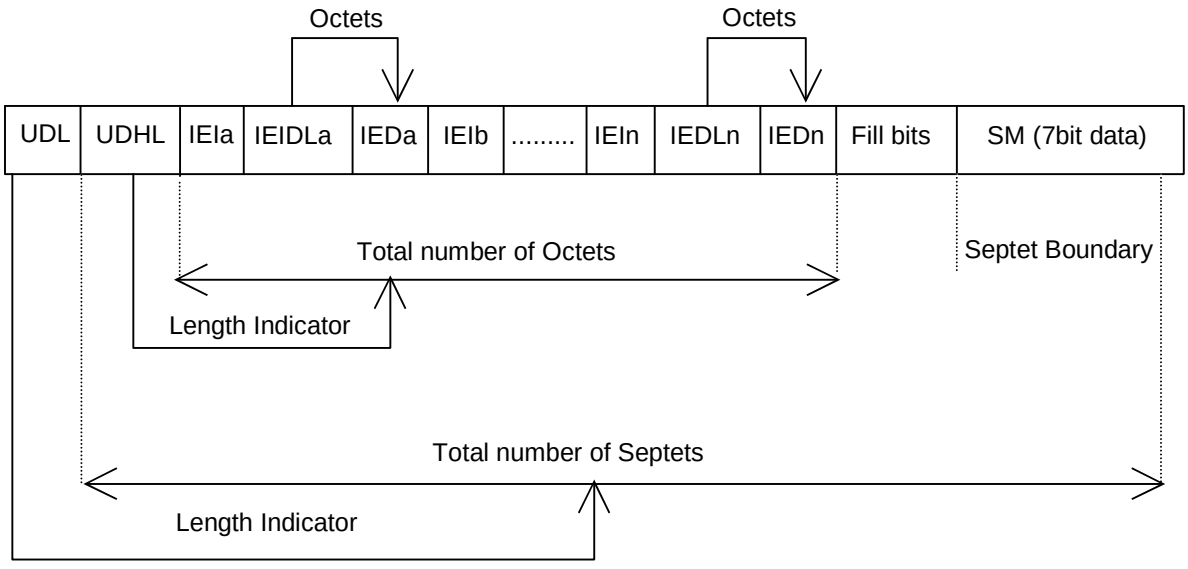


Figure 9.2.3.24 (a)

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for uncompressed 8 bit data or uncompressed UCS2 data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

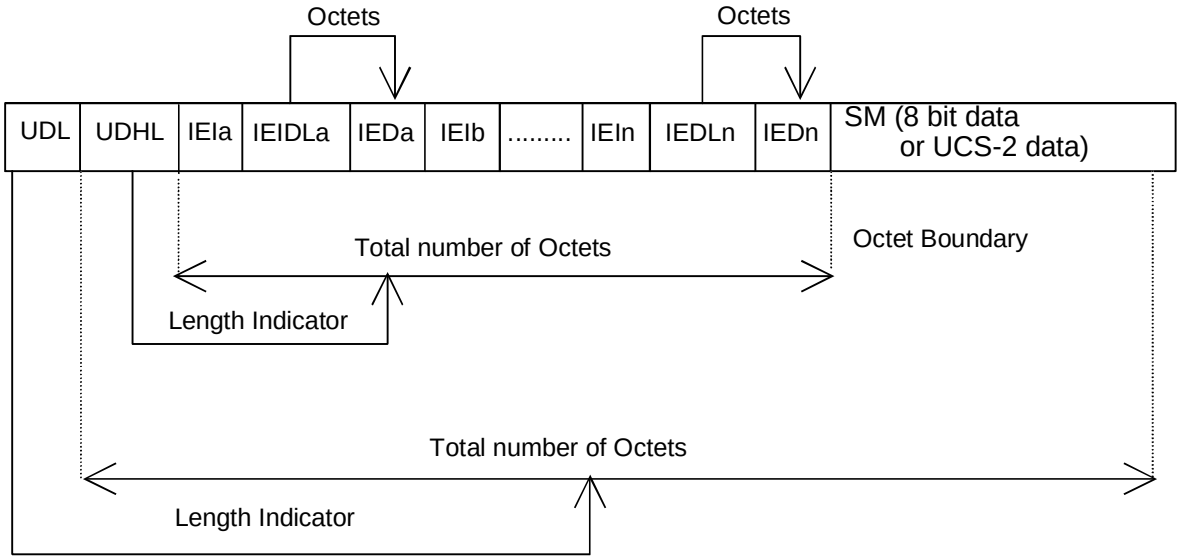


Figure 9.2.3.24 (b)

The diagram below shows the layout of the TP-User-Data-Length and the TP-User-Data for compressed GSM 7 bit default alphabet data, compressed 8 bit data or compressed UCS2 data. The UDHL field is the first octet of the TP-User-Data content of the Short Message.

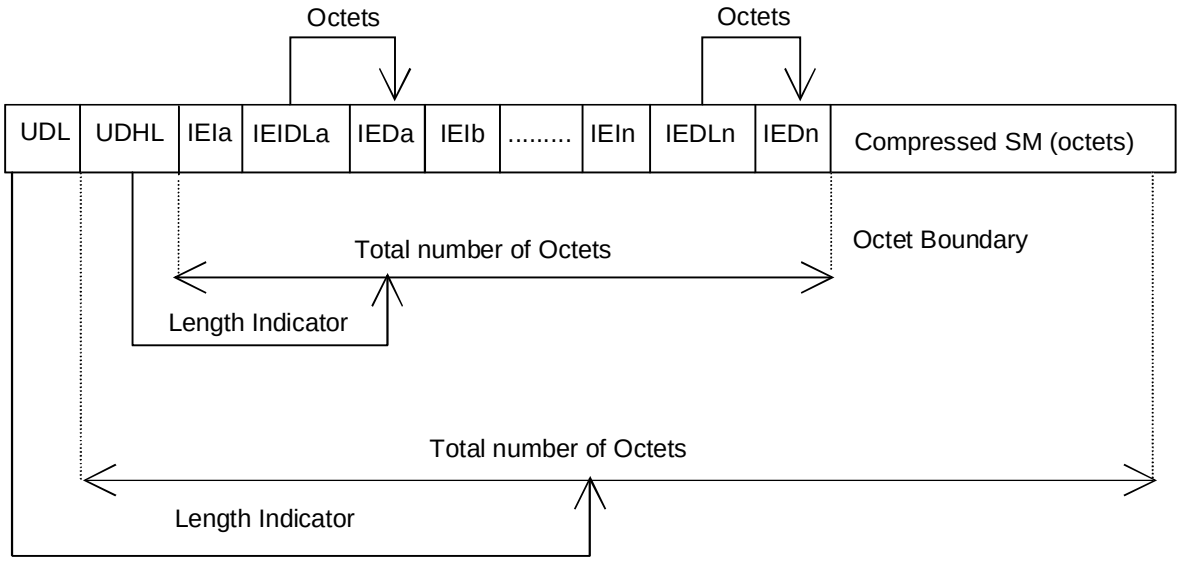


Figure 9.2.3.24 (c)

The definition of the TP-User-Data-Length field which immediately precedes the "Length of User Data Header" is unchanged and shall therefore be the total length of the TP-User-Data field including the Header, if present. (see 9.2.3.16)

The "Length-of-Information-Element" fields shall be the integer representation of the number of octets within its associated "Information-Element-Data" field which follows and shall not include itself in its count value.

The "Length-of-User-Data-Header" field shall be the integer representation of the number of octets within the "User-Data-Header" information fields which follow and shall not include itself in its count or any fill bits which may be present (see text below).

Information Elements may appear in any order and need not necessarily follow the order used in the present document.

In the case where there are no multiple instances of any Information Element type: If Information Elements are duplicated (either with the same or different content), within one single SM or within one segment of a concatenated message then the contents of the last occurrence of the Information Element shall be used.

In the case where there are multiple instances of any Information Element type: If certain types of Information Elements are duplicated (either with the same or different content) within one single SM or within one segment of a concatenated message and there is a contradiction in meaning (e.g. more than one Special Message Indication for voice) or there is a contradiction of Information Element types (e.g. an 8bit port address and a 16bit port address), then the contents of the last occurrence of the Information Element shall be used. Other types of Information Elements may occur more than once when there is additional information of the same type to be conveyed. The individual specifications for each Information Element will state if multiple use is permitted and in such a case will also indicate the maximum number of occurrences within one User Data Header.

If the length of the User Data Header overall is such that there appear to be too few or too many octets in the final Information Element then the whole User Data Header shall be ignored.

If any reserved values are received within the content of any Information Element then that part of the Information Element shall be ignored.

The Information Element Identifier octet shall be coded as follows:

VALUE (hex)	MEANING
00	Concatenated short messages, 8-bit reference number
01	Special SMS Message Indication
02	Reserved
03	Value not used to avoid misinterpretation as <LF> character
04	Application port addressing scheme, 8 bit address
05	Application port addressing scheme, 16 bit address
06	SMSC Control Parameters
07	UDH Source Indicator
08	Concatenated short message, 16-bit reference number
09	Wireless Control Message Protocol
0A	Text Formatting
0B	Predefined Sound
0C	User Defined Sound (iMelody max 128 bytes)
0D	Predefined Animation
0E	Large Animation (16*16 times 4 = 32*4 =128 bytes)
0F	Small Animation (8*8 times 4 = 8*4 =32 bytes)
10	Large Picture (32*32 = 128 bytes)
11	Small Picture (16*16 = 32 bytes)
12	Variable Picture
13	User prompt indicator
14	Extended Object
15	Reused Extended Object
16	Compression Control
174-1F	Reserved for future EMS features (see subclause 3.10)
20	RFC 822 E-Mail Header
21-6F	Reserved for future use
70 – 7F	(U)SIM Toolkit Security Headers
80 – 9F	SME to SME specific use
A0 – BF	Reserved for future use
C0 – DF	SC specific use
E0 – FF	Reserved for future use

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the IEI is Reserved or not supported. The receiving entity calculates the start of the next information element by looking at the length of the current information element and skipping that number of octets.

The SM itself may be coded as 7, 8 or 16 bit data.

If 7 bit data is used and the TP-UD-Header does not finish on a septet boundary then fill bits are inserted after the last Information Element Data octet up to the next septet boundary so that there is an integral number of septets for the entire TP-UD header. This is to ensure that the SM itself starts on an septet boundary so that an earlier Phase mobile shall be capable of displaying the SM itself although the TP-UD Header in the TP-UD field may not be understood.

It is optional to make the first character of the SM itself a Carriage Return character encoded according to the default 7 bit alphabet so that earlier Phase mobiles, which do not understand the TP-UD-Header, shall over-write the displayed TP-UD-Header with the SM itself.

If 16 bit (USC2) data is used then padding octets are not necessary. The SM itself shall start on an octet boundary.

If 8 bit data is used then padding is not necessary. An earlier Phase mobile shall be able to display the SM itself although the TP-UD header may not be understood.

It is also possible for mobiles not wishing to support the TP-UD header to check the value of the TP-UDHI bit in the SMS-Deliver PDU and the first octet of the TP-UD field and skip to the start of the SM and ignore the TP-UD header.

9.2.3.24.1 Concatenated Short Messages

This facility allows short messages to be concatenated to form a longer message.

In the case of uncompressed 8-bit data, the maximum length of the short message within the TP-UD field is 134 (140-6) octets.

In the case of uncompressed GSM 7 bit default alphabet data, the maximum length of the short message within the TP-UD field is 153 (160-7) characters.

In the case of 16 bit uncompressed USC2 data, the maximum length of the short message within the TP-UD field is 67 ((140-6)/2) characters. A UCS2 character must not be split in the middle; if the length of the User Data Header is odd, the maximum length of the whole TP-UD field is 139 octets.

In the case of compressed GSM 7 bit default alphabet data, 8 bit data or UCS2 the maximum length of the compressed short message within the TP-UD field is 134 (140-6) octets including the Compression Header and Compression Footer, both or either of which may be present (see subclause 3.9).

The maximum length of an uncompressed concatenated short message is 39015 (255*153) default alphabet characters, 34170 (255*134) octets or 17085 (255*67) UCS2 characters.

The maximum length of a compressed concatenated message is 34170 (255*134) octets including the Compression Header and Compression Footer (see subclause 3.9 and figure 9.2.3.24.1(a) below).

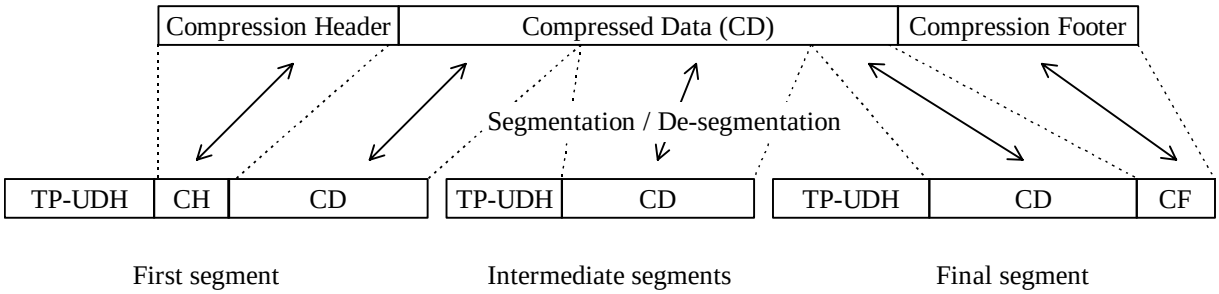


Figure 9.2.3.24.1 (a): Concatenation of a Compressed short message

The Information-Element-Data field contains information set by the application in the SMS-SUBMIT so that the receiving entity is able to re-assemble the short messages in the correct order. Each concatenated short message contains a reference number which together with the originating address and Service Centre address allows the receiving entity to discriminate between concatenated short messages sent from different originating SMEs and/or SCs. In a network which has multiple SCs, it is possible for different segments of a concatenated SM to be sent via different SCs and so it is recommended that the SC address should not be checked by the MS unless the application specifically requires such a check.

The TP elements in the SMS-SUBMIT PDU, apart from TP-MR, TP-SRR, TP-UDL and TP-UD, should remain unchanged for each SM which forms part of a concatenated SM, otherwise this may lead to irrational behaviour. TP-MR must be incremented for every segment of a concatenated message as defined in subclause 9.2.3.6. A SC shall handle segments of a concatenated message like any other short message. The relation between segments of a concatenated message is made only at the originator, where the message is segmented, and at the recipient, where the message is reassembled. SMS-COMMANDs identify messages by TP-MR and therefore apply to only one segment of a concatenated message. It is up to the originating SME to issue SMS-COMMANDs for all the required segments of a concatenated message.

The Information-Element-Data octets shall be coded as follows.

Octet 1 Concatenated short message reference number

This octet shall contain a modulo 256 counter indicating the reference number for a particular concatenated short message. This reference number shall remain constant for every short message which makes up a particular concatenated short message.

Octet 2 Maximum number of short messages in the concatenated short message.

This octet shall contain a value in the range 0 to 255 indicating the total number of short messages within the concatenated short message. The value shall start at 1 and remain constant for every short message which makes up the concatenated short message. If the value is zero then the receiving entity shall ignore the whole Information Element.

Octet 3 Sequence number of the current short message.

This octet shall contain a value in the range 0 to 255 indicating the sequence number of a particular short message within the concatenated short message. The value shall start at 1 and increment by one for every short message sent within the concatenated short message. If the value is zero or the value is greater than the value in octet 2 then the receiving entity shall ignore the whole Information Element.

The IEI and associated IEI length and IEI data shall be present in every segment of the concatenated SM.

9.2.3.24.2 Special SMS Message Indication

There are three levels of "Message Waiting" indication provided within the present document. The first level is to set the Protocol Identifier to "Return Call message", which indicates that a message is waiting and relies on the text of the message to supply the detail. The second level uses the Data Coding Scheme with or without Return Call Message (see 3GPP TS 23.038 [9]) to indicate the type of message waiting and whether there are some messages or no messages. The third level is described here, and provides the maximum detail level for analysis by the mobile, i.e. an indication of the number and type of messages waiting in systems connected to the PLMN. This third level is provided for future flexibility, as it cannot immediately be used without compatibility problems with the earliest Phase mobiles. It is envisaged that this scheme can start to be used once mobiles supporting TP-UDH become widely available.

This information shall be stored by the ME in the Message Waiting Indication Status on the USIM (see 3GPP TS 31.102) when present or otherwise should be stored in the ME. The number of messages shall be stored in Message Waiting Indication Status and an indicator should be shown if the number of messages is non-zero or removed if the number of messages is zero. The ME may also provide some MMI to indicate and access the actual number of messages waiting. Text may be included by the SMS Service Centre for backward compatibility with the earliest Phase mobiles and the Data Coding Scheme may also be used to convey this information in parallel for backward compatibility with "middle" Phase mobiles (which support the use of Data Coding Scheme for Message Waiting Indication but not the use of TP-UDH for Message Waiting Indication).

The information-Element octets shall be coded as follows:

Octet 1 Message Indication type and Storage

Bit 7 Indicates whether or not the message shall be stored.

Bit 7

0 Discard message after updating indication

1 Store message after updating indication

In the event of a conflict between this setting and the setting of the Data Coding Scheme (see 3GPP TS 23.038 [9]) then the message shall be stored if either the DCS indicates this, or Octet 1 above indicates this.

Bits 6..0 show the message indication type

000 0000	Voice Message Waiting
000 0001	Fax Message Waiting
000 0010	Electronic Mail Message Waiting
000 0011	Other Message Waiting (see 3GPP TS 23.038 [9] for definition of "other")

Other values are reserved for future use.

Octet 2 Message Count

This octet shall contain a value in the range 0 to 255 indicating the number of messages of the type specified in Octet 1 waiting. The value 255 shall be taken to mean 255 or greater. In the event of a conflict between this setting and the setting of the Data Coding Scheme (see 3GPP TS 23.038 [9]) then the Message Count in the TP-UDH shall override the indication in the TP-DCS.

If more than one type of message is required to be indicated within one SMS message, then further octets must be used, as in the following example:

[00] TP-UDL [1E] (30 decimal septets)

[01] Length of TP-UDH [08]

[02] IEI = Special SMS Message Indication [01]

[03] Length = 02

[04] Octet 1 = Voice Mail, do not store [00]

[05] Octet 2 = 04 Messages

[06] IEI = Special SMS Message Indication [01]

[07] Length = 02

[08] Octet 1 = Fax Mail, Store [81]

[09] Octet 2 = 02 Messages

+ 5 Fill bits

+ 19 seven-bit character message text

The Total number of bits is 210.

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.3 Application Port Addressing 8 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 2 octets

octet 1 Destination port

This octet contains a number indicating the receiving port, i.e. application, in the receiving device.

octet 2 Originator port

This octet contains a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 255 using 8 bit addressing space. The Integer value of the port number is presented as in 3GPP TS 23.040 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 239	Reserved
240 - 255	Available for allocation by applications

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IE is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data shall also be contained in every subsequent segment of the concatenated SM.

9.2.3.24.4 Application Port Addressing 16 bit address

This facility allows short messages to be routed to one of multiple applications in the TE (terminal equipment), using a method similar to TCP/UDP ports in a TCP/IP network. An application entity is uniquely identified by the pair of TP-DA/TP-OA and the port address. The port addressing is transparent to the transport, and also useful in Status Reports.

The total length of the IE is 4 octets

octet 1,2 Destination port

These octets contain a number indicating the receiving port, i.e. application, in the receiving device.

octet 3,4 Originator port

These octets contain a number indicating the sending port, i.e. application, in the sending device.

The port range is up to 65535 using 16 bit addressing space. The Integer value of the port number is presented as in 3GPP TS 23.040 subclause 9.1.2.1.

VALUE (port number)	MEANING
0 - 15999	As allocated by IANA (http://www.IANA.com/)
16000 - 16999	Available for allocation by applications
17000 - 65535	Reserved

A receiving entity shall ignore (i.e. skip over and commence processing at the next information element) any information element where the value of the Information-Element-Data is Reserved or not supported.

In the case where this IE is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data shall also be contained in every subsequent segment of the concatenated SM.

9.2.3.24.5 SMSC Control Parameters

The facility enables the SMS protocol headers to be expanded using a flexible method. It may be used to control the SMSC, but is also passed transparently to the receiving mobile. The Information Element must be present in every short message affected by it, i.e. in every short message in a concatenated message.

The Information Element data octets shall be coded as follows:

octet 1 Selective Status Report

This facility is used to control the creation of Status Reports, depending on the error code of the particular message. It is also used by the sending entity to request inclusion of the original UDH into the Status Report. In this case the original UDH must be separated from the rest of the UDH using the Source Indicator. The TP-SRR must be set in order for the Selective Status Report to be enabled. The bits are defined as follows:

bit 0

0 No Status Report for short message transaction completed

1 Status Report for short message transaction completed

bit 1

0 No Status Report for permanent error when SC is not making any more transfer attempts

1 Status Report for permanent error when SC is not making any more transfer attempts

bit 2

0 No Status Report for temporary error when SC is not making any more transfer attempts

1 Status Report for temporary error when SC is not making any more transfer attempts

bit 3

0 No Status Report for temporary error when SC is still trying to transfer SM

1 Status Report for temporary error when SC is still trying to transfer SM

bits 4 and 5

reserved for future use.

bit 6

0 No activation

1 A Status Report generated by this Short Message, due to a permanent error or last temporary error, cancels the SRR of the rest of the Short Messages in a concatenated message. This feature can only be used where a SC is aware of the segmentation of a concatenated SM and is therefore an implementation matter.

bit 7

0 Do not include original UDH into the Status Report

1 Include original UDH into the Status Report

9.2.3.24.6 UDH Source Indicator

The facility is used to separate the UDH of the original message, a UDH created by the SMSC, and a UDH provided by the original receiving entity. The Source Indicator is placed in front of the content inserted by the source. The indicated content (one or more Information-Elements) ends at the next UDH-Source-Indicator, or at the end of the UDH. The Separator is intended to be used especially in Status Reports, but can also be used by the SMSC to add information into Short Message (for example Message waiting). The default content for a UDH in a SMS-DELIVERY is the headers inserted by the sending device, and the default content for a UDH in a SMS-STATUS-REPORT is the headers copied from the SMS-DELIVERY-REPORT.

Values of octet:

01 The following part of the UDH is created by the original sender (valid in case of Status Report)

02 The following part of the UDH is created by the original receiver (valid in case of Status Report)

03 The following part of the UDH is created by the SMSC (can occur in any message or report)

In the case where this IEI is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data should also be contained in every subsequent segment of the concatenated SM although this is not mandatory. However, in the case where these elements are not contained in every subsequent segment of the concatenated SM and where an out of sequence segment delivery occurs or where the first segment is not delivered then processing difficulties may arise at the receiving entity which may result in the concatenated SM being totally or partially discarded.

9.2.3.24.7 (U)SIM Toolkit Security Headers

There are no IEI data values associated with these IEI values and so the associated Length of Information element field is present but set to zero.

These IEI values implicitly define that a Security Header is always present at the start of the TP-User-Data field which immediately follows the TP-User-Data-Header. Details of the Security Header will be found in GSM TS 43.048 [28].

In the case where a concatenated message contains a Security Header then the Security Header will only be present in the first segment of a concatenated message.

In the case where SMS compression is applied to a TP-User-Data field which contains a Security Header then the SMS compression header (3GPP TS 23.042 [26]) shall immediately precede the Security Header.

9.2.3.24.8 Concatenated short messages, 16-bit reference number

This facility is an enhanced variant of the Concatenated Short Message facility (see subclause 9.2.3.24.1). The enhancement is a 16-bit reference number, instead of the short 8-bit reference number. The larger reference number reduces the probability that two different concatenated messages are mistakenly sent with identical reference numbers to a receiver. Except for the size of the reference number this facility is identical to the Concatenated Short Message facility (see subclause 9.2.3.24.1).

In the case of uncompressed 8-bit data, the maximum length of the short message within the TP-UD field is 133 (140-7) octets.

In the case of uncompressed GSM 7 bit default alphabet data, the maximum length of the short message within the TP-UD field is 151 (160-9) characters.

In the case of 16 bit uncompressed USC2 data, the maximum length of the short message within the TP-UD field is 66 ((140-7)/2) characters. A UCS2 character must not be split in the middle; if the length of the User Data Header is odd, the maximum length of the whole TP-UD field is 139 octets.

In the case of compressed GSM 7 bit default alphabet data, 8 bit data or UCS2 the maximum length of the compressed short message within the TP-UD field is 133 (140-7) octets including the Compression Header and Compression Footer, both or either of which may be present (see subclause 3.9).

The relation between compression and concatenation is the same as for Concatenated Short Messages (see subclause 9.2.3.24.1).

The Information-Element-Data field contains information set by the application in the SMS-SUBMIT so that the receiving entity is able to re-assemble the short messages in the correct order. Each concatenated short message contains a reference number which together with the originating address and Service Centre address allows the receiving entity to discriminate between concatenated short messages sent from different originating SMEs and/or SCs. In a network which has multiple SCs, it is possible for different segments of a concatenated SM to be sent via different SCs and so it is recommended that the SC address should not be checked by the MS unless the application specifically requires such a check.

The TP elements in the SMS-SUBMIT PDU, apart from TP-MR, TP-UDL and TP-UD, should remain unchanged for each SM which forms part of a concatenated SM, otherwise this may lead to irrational behaviour. TP-MR must be incremented for every segment of a concatenated message as defined in subclause 9.2.3.6. A SC shall handle segments of concatenated message like any other short message. The relation between segments of a concatenated message is made at the originator, where the message is segmented, and at the recipient, where the message is reassembled. SMS-COMMANDs identify messages by TP-MR and therefore apply to only one segment of a concatenated message. It is up to the originating SME to issue SMS-COMMANDs for all the required segments of a concatenated message.

The Information-Element-Data octets shall be coded as follows.

Octet 1-2 Concatenated short messages, 16-bit reference number

This octet shall contain a modulo 65536 counter indicating the reference number for a particular enhanced concatenated short message. This reference number shall remain constant for every short message which makes up a particular enhanced concatenated short message.

Octet 3 Maximum number of short messages in the enhanced concatenated short message.

This octet shall contain a value in the range 0 to 255 indicating the total number of short messages within the concatenated short message. The value shall start at 1 and remain constant for every short message which makes up the enhanced concatenated short message. If the value is zero then the receiving entity shall ignore the whole Information Element.

Octet 4 Sequence number of the current short message.

This octet shall contain a value in the range 0 to 255 indicating the sequence number of a particular short message within the concatenated short message. The value shall start at 1 and increment by one for every short message sent within the concatenated short message. If the value is zero or the value is greater than the value in octet 3 then the receiving entity shall ignore the whole Information Element.

The IEI and associated IEI length and IEI data shall be present in every segment of the concatenated SM.

9.2.3.24.9 Wireless Control Message Protocol

The Wireless Control Message Protocol (WCMP) is part of the WAP suite of protocols; an open standard specified by the WAP Forum Ltd.

The protocol specifies a set of messages that can be used by the receiver to notify the sender if an error occurs. This can be due to routing problems, no application listening at the destination port number, or due to insufficient buffer capacity. The error messages can be used by the sender to avoid retransmitting packets, that can not be properly handled at the receiver. WCMP can also be used for diagnostics and informational purposes. WCMP messages are usually generated by a datagram transport layer or a management entity.

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1-n Protocol Data Unit of WCMP

This octet(s) shall contain a WCMP protocol data unit.

In the case where this IE is to be used in a concatenated SM then the IEI, its associated IEI length and IEI data shall be contained in the first segment of the concatenated SM. The IEI, its associated IEI length and IEI data shall also be contained in every subsequent segment of the concatenated SM.

9.2.3.24.10 Enhanced Messaging Service

9.2.3.24.10.1 EMS Coding

Enhanced Messaging is based on standard mechanism in GSM SMS messaging. The first mechanism is called **user data header** (TP-UDH), which makes it possible to include binary data in a normal SM prior the text message itself (subclause 9.2.3.24). The binary data is in the TP-UD field (message), which means that it steels a part of the 140 bytes. Each object within the SM shall be identified by a IE in the TP-UD Header. The IE will contain a **octet** (refer to subclause 9.2.3.24.10.1) that identifies the absolute position of the object within and from the beginning of the SM data. In case of formatting text, an additional octet will give the number of characters for which the formatting applies. Next mechanism that is used is **concatenation,** see subclause 9.2.3.24.1. This mechanism permits longer messages than 140 bytes, in fact 255 messages a 140 bytes each can be concatenated to one message up to about 38k bytes.

EMS IEs of the same type may occur more than once in a single message or one segment of a concatenated SM.

9.2.3.24.10.1.1 Text Formatting

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1 Start position of the text formatting. Set to the number of characters after the formatting shall be applied from the beginning of the SM data.

This octet shall be coded as an integer value in the range 0 (beginning of the SM data) to the maximum number of characters included in the SM data of one single SM or one segment of a concatenated SM.

Octet 2 Text formatting length. Gives the number of formatted characters

This octet shall be coded as an integer value in the range 1 to the maximum number of characters for which the formatting applies in one single SM or one segment of a concatenated SM.

Octet 3 formatting mode value coded as following:

Octet 3: Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 Bit 0

Bit 1	Bit 0	*Alignment
0	0	Left
0	1	Center
1	0	Right
1	1	Language dependent (default)

*in case formatting text is inserted on the same line as previous non formatting text or with a different mode value, the alignment value shall be set to the same value as the previous formatted predefined object.

Bit 3	Bit 2	Font Size
0	0	Normal (default)
0	1	Large
1	0	Small
1	1	*reserved*

Bit 4	Style **bold**
1	Bold on
0	Bold off

Bit 5	Style *Italic*
1	Italic on
0	Italic off

Bit 6	Style Underlined
1	Underlined on
0	Underlined off

Bit 7	Style ~~Strikethrough~~
1	Strikethrough on
0	Strikethrough off

If bit 4,5,6 and 7 are set to 0, it will mean normal style (default).

9.2.3.24.10.1.2 Predefined Sound

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1 position indicating in the SM data the instant after which the sound shall be played. It will be set to the number of characters from the beginning of the SM data after which the sound shall be played.

This octet shall be coded as an integer value in the range 0 (beginning of the SM data) to the maximum number of characters included in the SM data of one single SM or one segment of a concatenated SM

Octet 2 sound number. Shall be encoded as a integer value.

9.2.3.24.10.1.3 User Defined Sound

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1 position indicating in the SM data the instant the after which the sound shall be played (refer to subclause 9.2.3.24.10.1.2).

Octet 2-n Protocol Data Unit as described in subclause 9.2.3.24.10.3.1.

This octet(s) shall contain a User Defined Sound.

9.2.3.24.10.1.4 Predefined Animation

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1 position indicating in the SM data the instant the animation shall be displayed. Set to the number of characters from the beginning of the SM data after which the animation shall be displayed.

This octet shall be coded as an integer value in the range 0 (beginning of the SM data) to the maximum number of characters included in the SM data of one single SM or one segment of a concatenated SM

Octet 2 animation number. Shall be encoded as an integer value.

9.2.3.24.10.1.5 Large Animation

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1 position indicating the instant the animation shall be displayed in the SM data (refer subclause 9.2.3.24.10.1.4).

Octet 2-n Protocol Data Unit as described in subclause 9.2.3.24.10.3.3.

This octet(s) shall contain a Large Animation.

9.2.3.24.10.1.6 Small Animation

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1 position indicating the instant the animation shall be displayed in the SM data (refer subclause 9.2.3.24.10.1.4).

Octet 2-n Protocol Data Unit as described in subclause 9.2.3.24.10.3.3.

This octet(s) shall contain a Small Animation.

9.2.3.24.10.1.7 Large Picture

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1 position indicating in the SM data the instant the picture shall be displayed. Set to the number of characters from the beginning of the SM data after which the picture shall be displayed. This octet shall be coded as an integer value in the range 0 (beginning of the SM data) to the maximum number of characters included in the SM data of one single SM or one segment of a concatenated SM

Octet 2-n Protocol Data Unit as described in 9.2.3.24.10.3.2.

This octet(s) shall contain a Large Picture.

9.2.3.24.10.1.8 Small Picture

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1 position indicating in the SM data the instant the picture shall be displayed in the SM data (refer subclause 9.2.3.24.10.1.7).

Octet 2-n Protocol Data Unit as described in subclause 9.2.3.24.10.3.2.

This octet(s) shall contain a Small Picture.

9.2.3.24.10.1.9 Variable Picture

The Information-Element-Data octet(s) shall be coded as follows:

Octet 1 position indicating in the SM data the instant the picture shall be displayed in the SM data (refer subclause 9.2.3.24.10.1.7).

Octet 2 Horizontal dimension of the picture.

This octet shall contain the horizontal number of 8 pixels i.e. this value shall be multiplied by 8 to get the whole number of horizontal pixels.

Octet 3 Vertical dimension of the picture.

This octet shall contain the vertical number of pixels.

Octet 4-n Protocol Data Unit as described in subclause 9.2.3.24.10.3.2.

This octet(s) shall contain a Variable Picture line by line from top left to bottom right.

The values of the horizontal and vertical dimensions must be chosen properly by the sending entity. If the calculated size of this IE exceeds the limits of a single SM or segment it shall be discarded by the receiving entity.

Examples of EMS coding

All IE values in the TP-UD are hexadecimal values.

9.2.3.24.10.1.10 User Prompt Indicator

With the User Prompt Indicator a sending entity is able to indicate to the receiving entity, that the following object is intended to be handled at the time of reception, e.g. by means of user interaction. The object may be a picture, an animation, a User Defined Sound or a combination of these.

For example the User Prompt Indicator may be used when sending an operators logo to the ME that should be displayed instead of the operators name in standby mode.

When receiving the object the user shall be prompted to accept or discard the object. After this user interaction the SM may be discarded.

The User Prompt Indicator IE shall immediately precede the corresponding object IE(s).

If a User Prompt Indicator IE is not followed by a corresponding object IE it shall be discarded.

The Information-Element-Data octet(s) shall be coded as follows.

Octet 1 Number of corresponding objects

This octet shall contain the number of corresponding objects as an integer value.

9.2.3.24.10.1.11 Extended Object

The Extended Object allows an extended code range for format types. The Extended Object may extend across segment boundaries of a concatenated short message. Octets 1 through 7 of the first Extended Object IE shall be contained in a single segment. A single segment may include one or more Extended Object IEs.

If multiple SMs are concatenated and at least one of them contains an Extended Object information element, then concatenation of the SMs shall be done using the 'Concatenated short messages, 16-bit reference number', verses the 'Concatenated short messages, 8-bit reference number' information element. The re-assembly of the Extended Object segments shall be done according to the sequence number of the associated Concatenation IE.

One or more Extended Objects may be compressed using a compression algorithm as indicated in the Compression Control IE (see section 9.2.3.24.10.1.13).

An SME implementing the Extended Object IE shall be capable of interpreting an uncompressed concatenated message composed of at least **min_eo_msg** short messages which have been received. According to current content provider requirements and handset manufacturer constraints, variable **min_eo_msg** is set to 8.

The first Extended Object IE of an Extended Object contains a reference number, length, control data, type and position. The subsequent Extended Object IEs shall only contain Extended Object data as illustrated in Figure 9.2.24.10.11.

The IE length is variable.

Octet 1 Extended Object reference number
a modulo 256 counter indicating the reference number for the Extended Object. Two different Extended Objects in a single concatenated message shall have different reference numbers.

Octet 2..3 Extended Object length in number of octets (integer representation) as shown in Figure 9.2.3.24.10.1.11.

Octet 4 Control data

Bit 0 Object distribution

0 Object may be forwarded
1 Object shall not be forwarded by SMS

Bit 1 User Prompt Indicator

0 Object shall be handled normally
1 Object shall be handled as a User Prompt (see 9.2.3.24.10.1.10)

Bit 2..7 reserved

Any reserved values shall be set to 0.

Octet 5 Extended Object Type

This octet indicates the format of the Extended Object from the table below.
If the value is reserved or if the associated format is not supported then the receiving entity shall ignore the Extend Object.

Format Type	**Format Description**
0x00	Predefined sound as defined in annex F.
0x01	iMelody as defined in annex F.
0x02	Black and white bitmap as defined in annex F.
0x03	2-bit greyscale bitmap as defined in annex F.
0x04	6-bit colour bitmap as defined in annex F.
0x05	Predefined animation as defined in annex F.
0x06	Black and white bitmap animation as defined in annex F.
0x07	2-bit greyscale bitmap animation as defined in annex F.
0x08	6-bit colour bitmap animation as defined in annex F.
0x09	vCard as defined in annex F.
0x0A	vCalendar as defined in annex F.
0x0B..0xFF	Reserved

Octet 6..7 Extended Object Position (integer representation)

The Extended Object Position indicates the absolute character position within the message text after which the object shall be played or displayed. The absolute character position relates to the entire text within the concatenated message, the first character is numbered character 1.

If more than one Extended Object is located at the same position then they may be played or displayed in sequence or simultaneously.

Octet 8..n Extended Object Data

This sequence of octets is structured as illustrated in the figure below and defined annex F. This figure illustrates the construction of a number of SMs containing a large Extended Object which crosses a SM boundary and is encoded into 2 SM TPDUs. The figure illustrates only the User Data field of the SM (TPDUs). For a description of concatenation of SM refer to Figures 9.2.3.24 (a,b and c)

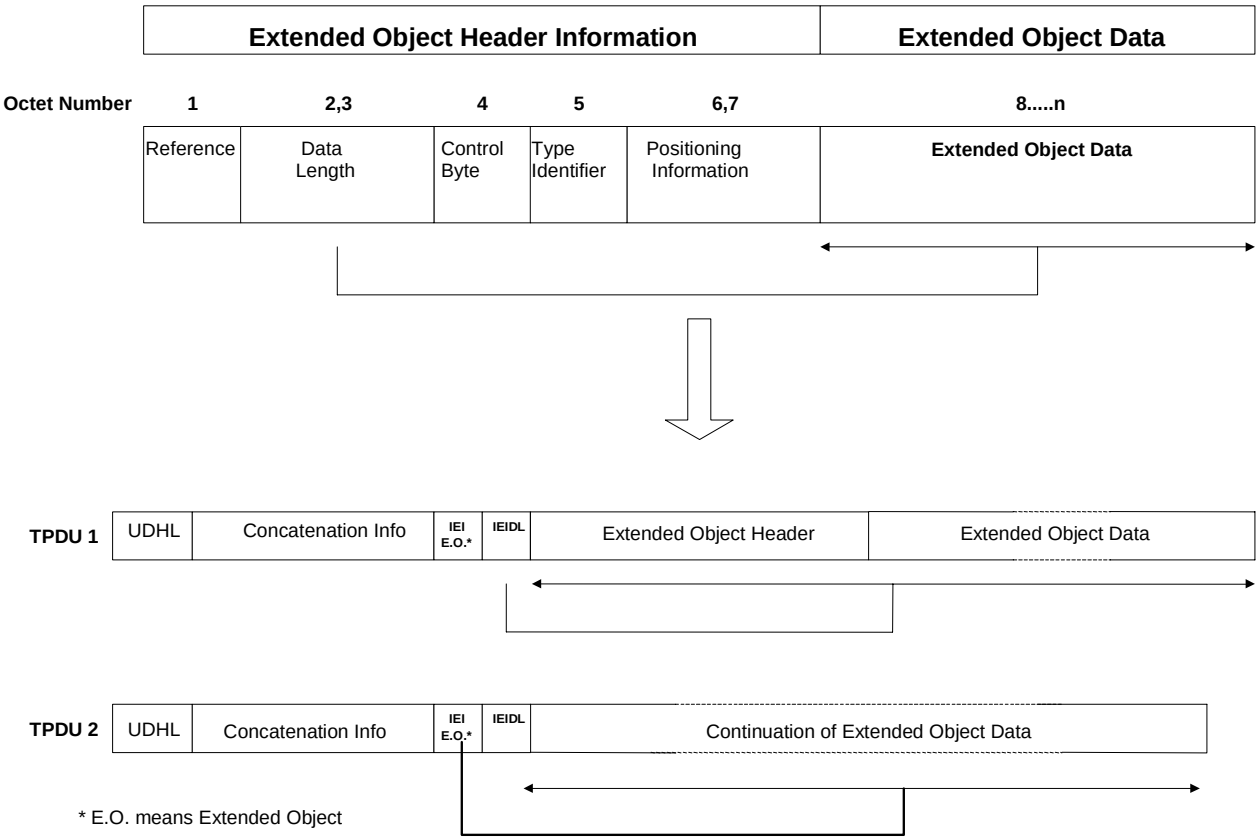


Figure 9.2.3.24.10.1.11

9.2.3.24.10.1.12 Reused Extended Object

This facility is used to reuse an Extended Object in a message which has already been defined in the same message.

Octet 1 Reference number of the Extended Object to be reused.

Octet 2..3 indicates in the concatenated message the absolute character position after which the object shall be played or displayed.

9.2.3.24.10.1.13 Compression Control

This information element is used to indicate a compressed bytestream containing one or more Extended Objects. The compressed bytestream may extend across sequential short messages within a concatenated short message as illustrated by Figure 9.2.24.10.1.13 The first Compression Control IE of a compressed bytestream contains one octet of Compression Information and a 2-octet length field.

The SME shall support decompression if the Extended Object IE is implemented. An SME implementing the Extending Object IE shall be capable of decompressing a received stream for which the original uncompressed information fits into 1 to **min_eo_msg** messages. An SME may be capable of decompressing a received stream for which the original uncompressed information fits into more than **min_eo_msg** short messages. Variable **min_eo_msg** is defined in section 9.2.3.24.10.1.11.

The IE length is variable.

Octet 1 Compression information

Bits 0..3 represent the compression algorithm and bits 4..7 represent compression algorithm specific parameters.

Bit 0..3 Compression algorithm

0000 RFC 1951 compression [35]

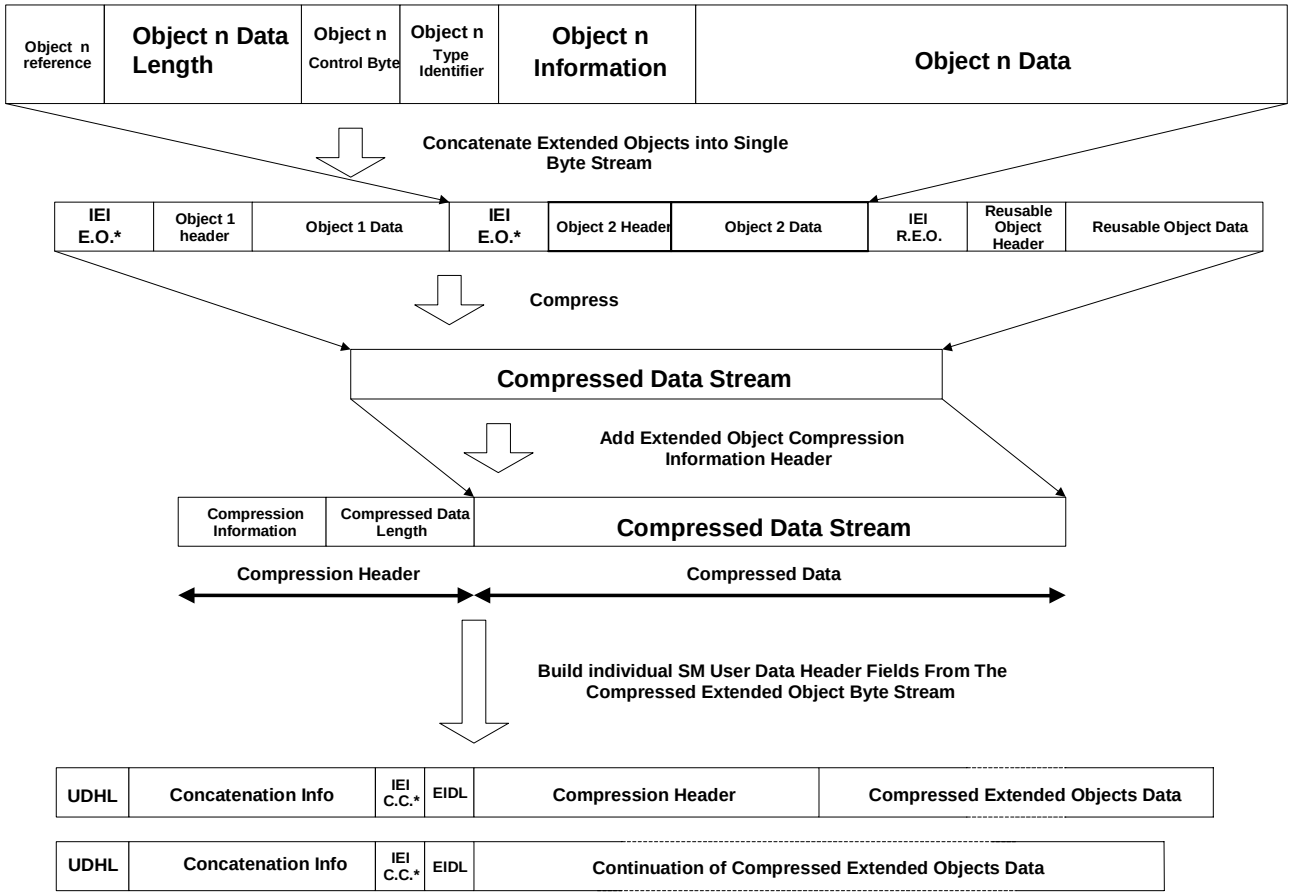
Bit 4..7 Window size factor n (integer representation)
Window size in octets= (n+1) * 64

0001..1111 reserved for future use; reserved bits shall be transmitted 0.

Bit 4..7 reserved

Octets 2..3 Length of the compressed bytestream in octets (integer representation)
The length indicates the length of the bytestream that may extend across several compression control IEs.

Octets 4..n Compressed data may contain one or more compressed Extended Objects. Figure 9.2.3.24.10.1.13 is an example and illustrates the assembly of a series of SM TPDUs from a sequence of concatenated and compressed extended objects. Each Extended Object is preceded by its IEI (Extended Object or Reused Extended Object). A series of Extended Objects is then compressed into a single buffer and this is split into several SM TPDUs as illustrated.



* E.O. means Extended

R.E.O. means Reused Extended

C.C. means Compression

Figure 9.2.3.24.10.1.13

9.2.3.24.10.2.1 Example of Basic text formatting and predefined EMS coding

An example of the basic concept of coding is given as follows:

TP-UDHI=1

SMS User Data Header: UDHL=05, IEI=0A, IEDL=03, IED_1=0F, IED_2=12, IED_3=10

SMS User Data: This is a text with bold option on following with normal text.

Should be displayed as:

This is a text **with bold option on** following with normal text.

It is also possible to add predefined sounds in the message.

Example:

TP-UDHI=1

SMS User Data Header: UDHL=08, IEI=0B, IEDL=02, IED_1=09,<sound5>, IEI=0B, IEDL=2, IED_1=1C, <sound7>

SMS User Data: This is a message with two different sounds

The sound nr5 shall be played after the 9th received character ("a") and sound nr7 shall be played after the 28th received character ("e").

9.2.3.24.10.2.2 Example of User defined Objects EMS coding

Example of a message including one small picture is coded as follows:

TP UDHI=1

SMS User Data Header: UDHL=24, IEI=11, IEIDL=22, IED_1=08, <  (small picture 32bytes)>

SMS User Data: Hello!<CR><LF><CR><LF>One small picture in here

Should be displayed as:

Hello!

One small picture in here

If the message starts with <CR>, then the "unreadable" data in an old terminal will be overwritten by the text, and the user will not see any strange characters. It is possible to insert the same picture several times in the same message. In that case, the TP-UD header shall contain as many IE as the number of occurrences contained in the SM or one segment of a concatenated message. Using defined elements will normally imply that more than one SM is required and therefore concatenation is required.

9.2.3.24.10.2.3 Concatenation of SMS messages

Concatenated messages are required in most cases required when using several types of EMS elements, since it is only possible to send one large picture/large animation/melody in one single SM. After including either of these elements, there are only 4 (or 9 if no concatenation is used) characters left to the text part, and this is usually too little.

If one or more objects are embedded in one segment of a concatenated message, the IE octet indicating its/their position within the SM data cannot be set to a value that would refer to a position in the next segment(s) so that received segments should be processed before all of them have been received. It means that a formatting text that could not be conveyed in one segment shall be split in as many segments as necessary. In that case, the IE relating to the formatting shall be repeated in all the segments in which it will apply.

Example of a message including 2 Large Pictures, 4 Small animations and 2 User defined Melodies together with some text.

The EMS message: <Large Picture1> <User Defined Melody 1> Hello All, This is a real Enhanced Message <Small Animation 1>. I can send <Small Animation 2> and receive <Small Animation 3> really advanced EMS messages <Animation 4> Isn't it impressive? /Lars <User Defined Melody2> <Large Picture 2>

This EMS message has to use concatenated messages and the SM will typically contain the following data:

SM	User Data Header	User Data
1	IEI=10 (Large Picture) IED_1=00 (beginning of the SM) <Large Picture 1 (128 bytes)>	[<CR><LF>]
2	IEI=0C (User Defined Sound) IED_1=00 (beginning of the SM) <User Melody 1 (129bytes max)>	Hello
3	IEI=0F (Small Animation) IED_1=24 (36th position) <Small Animation 1 (32 bytes)> IEI=0F (Small Animation) IED_1=2F (47th position) <Small Animation 2 (32 bytes)>	All, This is a real Enhanced Message. I can send and
4	IEI=0F (Small Animation) IED_1=07 (7th position) <Small Animation 3 (32 bytes)> IEI=0F (Small Animation) IED_1=25 (37th position) <Small Animation 4 (32 bytes)>	receive really advanced EMS messages. Isn't it impressive? /Lars.
5	IEI=0C (User Defined Sound) IED_1=00 (beginning of the SM) <User Melody 1 (128 bytes max)>	[<CR><LF>]
6	IEI=10 (Large Picture) IED_1=00 (beginning of the SM) <Large Picture 2 (128 bytes)>	

…

Annex F (normative)
Extended Object Format Type

F.1 Predefined Sound

The predefined sound as integrated in the Extended Object IE is structured as follows:

Octet 8 Sound number as defined in table of section 9.2.3.24.10.3.1.

F.2 iMelody

An iMelody object [33] can be integrated in an Extended Object IE with the following structure:

Octet 8..n iMelody object coded according to the iMelody format [33].

F.3 Black and white bitmap

The user-defined black and white bitmap as integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels

Octet 9 Vertical dimension of picture
This octet shall contain the vertical number of pixels.

Octet 10..n Picture data, pixel by pixel from top left to bottom right. The picture data is encoded as a continuous sequence of bits. There shall be no fill bits at the end of each row of data, Fill bits may only be used in the last octet of the picture data if needed. The fill bits in the last octet shall be ignored. Within each octet the MSB represents the leftmost pixel. .

The colour values are encoded as follows

Bit Value	Colour
0	White
1	Black

F.4 2-bit greyscale bitmap

The user-defined 2-bit greyscale bitmap as integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels

Octet 9 Vertical dimension of picture
This octet shall contain the vertical number of pixels.

Octet 10..n Picture data, pixel by pixel from top left to bottom right. The picture data is encoded as a continuous sequence of bits. There shall be no fill bits at the end of each row of data, Fill bits may only be used in the last octet of the picture data. The fill bits in the last octet shall be ignored.The pair of bits at the MSB represents the leftmost pixel of the four defined in an octet.

The colour values are encoded as follows

Bit Value	Colour
00	Black
01	Dark Grey

10 Light Grey
11 White

F.5 6-bit colour bitmap

The user-defined 6-bit colour bitmap as integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels

Octet 9 Vertical dimension of picture
This octet shall contain the vertical number of pixels.

Octet 10..n

Picture data, pixel by pixel from top left to bottom right. The picture data is encoded as a continuous sequence of bits. There shall be no fill bits at the end of each row of data, Fill bits may only be used in the last octet of the picture data. The fill bits in the last octet shall be ignored.

Each pixel colour is represented by 6-bits of data, giving a total of 64 colours. (2 bits of data define the levels of each red, green and blue). The overall pixel colour is a composite of the three RGB values.

The first pair of bits of picture data define the level of red of the topmost, leftmost pixel, the next pair of bits the level of green for this pixel, and the third pair the level of blue for the pixel. The first bit of a pair defining a colour level is the MSB. This is illustrated below.

Octet 1							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MSB Red Pixel 1	LSB Red Pixel 1	MSB Green Pixel 1	LSB Green Pixel 1	MSB Blue Pixel 1	LSB Blue Pixel 1	MSB Red Pixel 2	LSB Red Pixel 2

Octet 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MSB Green Pixel 2	LSB Green Pixel 2	MSB Blue Pixel 2	LSB Blue Pixel 2	MSB Red Pixel 3	LSB Red Pixel 3	MSB Green Pixel 3	LSB Green Pixel 3

F.6 Predefined animation

The predefined animation as integrated in the Extended Object IE is structured as follows:

Octet 8 Animation number as defined in table of section 9.2.3.24.10.3.3.

F.7 Black and white bitmap animation

The user-black and white animation is integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels

Octet 9 Vertical dimension of picture.
This octet shall contain the vertical number of pixels.

Octet 10 The number of frames in the animation

Octet 11 Animation control byte

Bits	**Meaning**
7 - 4	Frame display. The value (in tenths of a second) that is requested between each frame: 0000 1 tenth (i.e. 0.1s) 1111 16 tenths (i.e. 1.6 s)
3 - 0	Repeat value. The requested number of repetitions of the animation: 0000 Unlimited repetition 0001 1 repetition 1111 15 repetitions

Octet 12..n Contains a series of bitstreams encoding 1 bit pixel depth bitmaps as defined in F.3. If a frame in the animation would require fill bits (as described in F.3) these shall be contained at the end of the frame such that the bit-stream for the next frame begins on an octet boundary.

F.8 2-bit greyscale bitmap animation

The user-black and white animation is integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels .

Octet 9 Vertical dimension of picture.
This octet shall contain the vertical number of pixels.

Octet 10 The number of frames in the animation

Octet 11 Animation control byte

Bits	**Meaning**
7 - 4	Frame display. The value (in tenths of a second) that is requested between each frame: 0000 1 tenth (i.e. 0.1s) 1111 16 tenths (i.e. 1.6 s)
3 - 0	Repeat value. The requested number of repetitions of the animation: 0000 Unlimited repetition 0001 1 repetition 1111 15 repetitions

Octet 12..n Contains a series of bitstreams encoding 2 bit pixel depth bitmaps as defined in F.4. If a frame in the animation would require fill bits (as described in F.4) these shall be contained at the end of the frame such that the bit-stream for the next frame begins on an octet boundary.

F.9 6-bit colour bitmap animation

The user-black and white animation is integrated in the Extended Object IE is structured as follows:

Octet 8 Horizontal dimension of picture
This octet shall contain the horizontal number of pixels

Octet 9 Vertical dimension of picture.
This octet shall contain the vertical number of pixels.

Octet 10 The number of frames in the animation

Octet 11 Animation control byte

Bits	**Meaning**
7 - 4	Frame display. The value (in tenths of a second) that is requested between each frame: 0000 1 tenth (i.e. 0.1s) 1111 16 tenths (i.e. 1.6 s)
3 - 0	Repeat value. The requested number of repetitions of the animation: 0000 Unlimited repetition 0001 1 repetition 1111 15 repetitions

Octet 12..n Contains a series of bitstreams encoding 6 bit pixel depth bitmaps as defined in F.5. If a frame in the animation would require fill bits (as described in F.5) these shall be contained at the end of the frame such that the bit-stream for the next frame begins on an octet boundary.

F.10 vCard

A vCard object [36] can be integrated in a Extended Object IE with the following structure:

Octet 8..n vCard object as defined in [36]. The UTF-8 encoding is used instead of the default 7-bit ASCII. For certain vCard properties, other encoding can be used by setting the CHARSET property parameter to the appropriate character set.

F.11 vCalendar

A vCalendar object [37] can be integrated in a Extended Object IE with the following structure:

Octet 8..n vCalendar object as defined in [37]. The UTF-8 encoding is used instead of the default 7-bit ASCII. For certain vCalendar properties, other encoding can be used by setting the CHARSET property parameter to the appropriate character set.