

Smart Messaging in CDMA

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Messaging

NOKIA

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Change History

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1 Introduction

SMS services were first created for GSM and later appeared in CDMA and TDMA networks. In the CDMA network, a solution was needed in order to provide bearer support for client-to-client smart messaging. One answer is to use Wireless Datagram Protocol (WDP) headers. The WDP specifications (defined by the WAP Forum, now known as OMA) define how SMS can be used for generic data transport over various bearer technologies [6].

The following document provides the information needed to use the smart messaging functionality of Nokia's CDMA mobile terminals. Most Nokia mobile phones are capable of receiving smart messages. These messages can contain a variety of data including ring tones, operator logos, group graphics (caller line identification icons), picture messages, business cards (vCard), and calendar bookings (vCalendar). However, each smart message can contain, at most, one of these items at a time.

Note : This document is intended to help developers create their own smart messages and show them how to encode data for specific mobile application services. To acquire ring tones and logos, developers should visit <http://www.club.nokia.com>. A network service provider may also have services where developers can acquire ring tones and logos.

2 WDP Architectural Overview

This document specifies the adaptation of WDP for CDMA SMS bearer service. Figure 1 shows a general model of how WDP fits into the WAP protocol architecture.

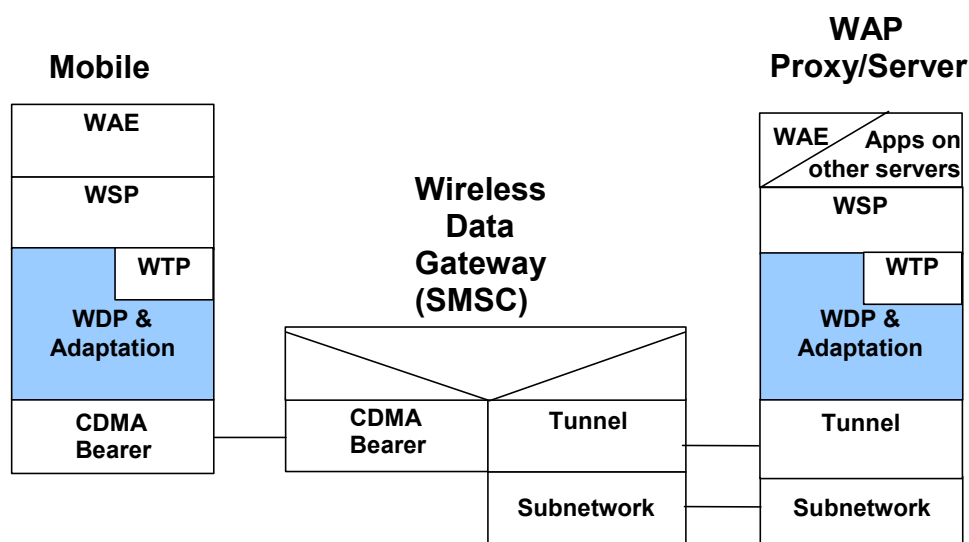


Figure 1: WDP in WAP architecture [6]

The transport layer protocol in the WAP architecture is the Wireless Datagram Protocol (WDP). The WDP protocol operates above the data-capable bearer services supported by multiple network types. WDP offers a consistent but unreliable service to the upper level protocols of WAP and communicates transparently over one of the available bearer services.

3 CDMA SMS Header Format

3.1 Mapping of WDP to CDMA SMS Text-Based Headers

WDP text-based headers are designed as an optional method for environments that support only reduced character sets (for example, not 8-bit binary headers). In WDP [6], a generic mechanism in similar environments is described and it can be used in CDMA SMS as well as in GSM. An exception to that specification is that only the long address format is used.

No protocol indication at a higher level is needed to indicate the presence of protocol information in the data part of the message. The first characters “//SCKL” identify the WDP datagram addressing scheme to the receiving device. The header can be presented in various lengths, from 4 bytes (only destination port) to 15 bytes (containing full WDP information), in addition to the 6 bytes of “//SCKL”. Mapping of WDP for SMS occurs as shown in Figure 2.

```

<WDP-text-socket-header> ::=
    <WDP-keyword><WDP-port-information>[<WDP-other-header>]<WDP-delimiter>

<WDP-delimiter> ::= <space>
<WDP-keyword> ::= "//SCKL"
<WDP-port-information> ::= <WDP-long-destination-address> |
    <WDP-long-destination-address> <WDP-long-source-address> |
    <WDP-long-destination-address> <WDP-long-source-address> <WDP-SAR-info>

<WDP-long-destination-address> ::= <hex-digit><hex-digit><hex-digit><hex-digit>
    Destination WDP port in ASCII coded hexadecimal {0000..FFFF}
<WDP-long-source-address> ::= <hex-digit><hex-digit><hex-digit><hex-digit>
    Destination WDP port in ASCII coded hexadecimal {0000..FFFF}

<WDP-SAR-info> ::=
    <WDP-SAR-reference><WDP-SAR-total-segments><WDP-SAR-current-segment>
<WDP-SAR-reference> ::= <hex-digit><hex-digit>
    Concatenated message reference number in ASCII coded hexadecimal
    {00..FF}... i.e., decimal {0..255}
  
```

Figure 2: Description of WDP headers when mapped for SMS

For more details about WDP headers, refer to the *WDP Specifications* [6].

Note : In BNF notation, “::=” means “definition” where a non-terminal symbol is on the left side of the operator “::=”, and the definition is on the right side. The operator “[]” is used as a delimiter between multiple choices. Optional parts are enclosed in meta symbols [and]. [7]

For more details about how WDP text elements are used for smart messaging elements such as graphical logos and ring tones, refer to the *Smart Messaging Specification* [7].

7	6	5	4	3	2	1	0
"/"							
"/"							
"S"							
"C"							
"K"							
"L"							
Destination port MSB (High hex)					1		
Destination port MSB (Low hex)					5		
Destination port LSB (High hex)					8		
Destination port LSB (Low hex)					1		
Originator Port MSB (High hex)					1		
Originator Port MSB (Low hex)					5		
Originator Port LSB (High hex)					8		
Originator Port LSB (Low hex)					1		
Reference number (High hex)					0		
Reference number (Low hex)					1		
Total number of <i>segments</i> (High hex)					ex.0		
Total number of <i>segments</i> (Low hex)					ex.5		
Segment count (High hex)					ex. 0		
Segment count (Low hex)					ex. 1		
<space>							
1 - n 8-bit characters of User Data							
7	6	5	4	3	2	1	0

Figure 3: Description of WDP headers when mapped for compatibility with CDMA networks

Figure 3 shows a byte mapping of the WDP headers for smart messaging (the same headers shown in Figure 2).

The text-based headers should always be terminated with a space (" ") character before the user data begins. This allows for future enhancements to the protocol.

Note : When sending messages from an application (on a network) to the mobile terminal, any characters before the "//SCKL" header will automatically be omitted.

Segmentation of user data is allowed, but the maximum number of segments is three. See Section 5.2 for an example of a segmented message.

When creating smart messages with large user data, it is important to remember that some mobile terminals do not support message concatenation (although most new Nokia mobile phones do support concatenation). These devices might truncate the header or omit the segmentation and reassembly part of the header. Refer to Section 7.5 of the *WDP Specification* for details on segmentation and reassembly [6].

3.2 WDP Port Numbers

As explained in Chapter 2, WDP is bearer-independent. Services using WDP (such as smart messaging) can be adapted to work over a variety of network technologies (like GSM, CDMA, and TDMA). This is accomplished by defining port numbers that are specifically reserved for particular services or application protocols. In other words, each port number has a specific exchange format associated with it.

The table in Figure 4 defines the WDP port numbers as approved by the Internet Association Numbering Authority (IANA) for use by the WAP Forum (OMA) [7].

Port Number (decimal)	Port Number (hexadecimal)	Application/Protocol
5505	1581	Ring Tone Receiver
		Protocol: Ring Tone
5506	1582	Operator Logo Receiver
		Protocol: Operator Logo/Datagram
5507	1583	CLI Logo Receiver
		Protocol: CLI Logo/Datagram
9200	23F0	Connectionless WAP Browser Proxy Server
		Protocol: WSP/Datagram
9202	23F2	Secure Connectionless WAP Browser Proxy Server
		Protocol: WSP/WTLS/Datagram
9201	23F1	WAP Browser Proxy Server
		Protocol: WSP/WTP/Datagram
9203	23F3	Secure WAP Browser Proxy Server
		Protocol: WSP/WTP/WTLS/Datagram
9204	23F4	vCard Receiver
		Protocol: vCard/Datagram
9206	23F6	Secure vCard Receiver
		Protocol: vCard/WTLS/Datagram
9205	23F5	vCalendar Receiver
		Protocol: vCalendar/Datagram
9207	23F7	Secure vCalendar Receiver
		Protocol: vCalendar/WTLS/Datagram

Figure 4: WAP port numbers used in smart messaging

These port numbers are used in the <WDP-long-destination-address> and the <WDP-long-source-address> as shown in Figure 2.

Note : These port numbers have been reserved from the NBS port number space. For an updated list of reserved TCP/UDP port numbers, please visit <http://www.iana.org/assignments/port-numbers>.

4 Character Sets and Character Conversions

CDMA smart messaging applications that use binary data (such as a ring tone or icon) require the conversion of the binary data into IRA-encoded characters (International Reference Alphabet, the international version of ASCII) [9].

<u>Data type</u>	<u>Data coding</u>	<u>Encoding identifier</u>
Ring Tone	8 bit	IRA (*)
vCalendar	7 bit	IRA
vCard	7 bit	IRA
CLI icon	8 bit	IRA (*)
Operator logo	8 bit	IRA (*)

Figure 5: Data type conversion guide

The *Nokia Smart Messaging Specification 3.0.0* [7] defines the binary data format for ring tones (Section 3.6) and CLI icons (Section 3.7).

IRA encoding is a 7-bit encoding. Therefore, native 8-bit data of ring tones and CLI icons is sent as 7-bit IRA encoded characters. Items denoted with (*) in Figure 5 are 8-bit octets represented by two IRA (7-bit) encoded characters. This is a temporary solution until networks support 8-bit data. Also, an Encoding Identifier for 8-bit binary data has yet to be defined. After these issues are solved more compact binary delivery is possible.

When CDMA SMS (CMT) is used as a smart messaging bearer for binary data (CLI icons and ring tones), the IRA 7-bit data encoding conventions apply. If 8-bit messaging protocols like GUTS are used, there is no need for special binary data encoding.

In CDMA smart messaging, mobile terminals expect to receive binary data as IRA-encoded characters according to the table in Figure 6.

Original Binary Data	In Hex	IRA Coded Characters Received by MS	Binary Representation of IRA Characters
10101010	AA	A and A	1000001 and 1000001
11111111	FF	F and F	1000110 and 1000110

Figure 6: IRA encoding example

As shown in Figure 6, two 7-bit characters are used to represent each byte (8 bits). Remember that the largest presentable hex figure with 8 bits is "FF". However, with 7 bits each character can represent hex figures only up to "7F". Each IRA character represents half a byte in hexadecimal. Therefore, in CDMA smart messaging, where smart messages are IRA encoded (7-bit), each byte (8 bits) is sent as two IRA characters. The mobile terminal will then decode these two IRA characters as binary data (into 1 byte).

Note : Content providers and SMSC service providers should perform the required conversions to ensure that regular 8-bit binary data is sent as data represented by IRA 7-bit characters in CDMA smart messages.

5 Message Formats and Examples

The following are examples of various message formats used for exchange of vCards, vCalendars, ring tones, and CLI icons. If this kind of user data is sent over CDMA SMS (CMT) it will appear in a smart messaging or WAP-capable phone as a special message. In the examples below, the *<space>* represents an empty space (" ") in the characters.

5.1 Example of a Ring Tone

The following is an example of a ring tone. Notice that this ring tone has been concatenated into two message segments.

```
//SCKL15811581010201<space>
024A3A5D1185CD09BDBDD004004688C28926C22C26C28C30C36934C30C34

//SCKL15811581010202<space>
C36C493616290420B24AB09B0AB0B30D312452838C34C38C4916156182902000
```

The Ring Tone Reader listens on Port 1581 (hexadecimal) of the mobile terminal. For more information on ring tone encoding, refer to Section 5.1.5 of the *Smart Messaging Specification 3.0.0* [7].

5.2 Example of an Operator Logo

The following is an example of an operator logo message format. The operator logo receiver listens on Port 1582 (hexadecimal) of a smart messaging capable mobile phone.

```
//SCKL15821582040301<space>
27DE0100480E0100107FFFE040A00000002020004000E2A80018881B6D800124419027C0
1B6D803F2200004081F000FFC027841E018200000040210

//SCKL15821582040302<space>
01E07E55950042023801CFFF9C552AA1FFFF020800149D2AA00001020860144500000002
842E6FFFFFFFFFFFFFFFFFC170040000000000A84438020000

//SCKL15821582040303<space>00000054331FFFFFFFFFFFFFFFFFFE7
```

In the example, the user data (a bit-map representation of the operator logo) begins after a space following the WDP headers (after the *<space>*).

Notice that this one operator logo is quite large and needed to be segmented into three SMS messages. See Figure 2 for a mapping of this example to the WDP headers.

```
<WDP-long-destination-address> = 1582
<WDP-long-source-address> = 1582
<WDP-SAR-total-segments> = 03
<WDP-SAR-current-segment> = 01, 02, or 03 (in each message)
```

The maximum allowed number of concatenated segments is three. According to the "WDP-SAR-total-segments" header, this smart message is composed of "03" total segments, which are each identified by the "WDP-SAR-current-segment" header.

5.3 Example of a Caller Line ID Icon

The following is an example of a Caller Line ID (CLI) Icon. The CLI Icon Reader listens on Port 1583 (hexadecimal) of a smart messaging capable mobile phone.

```
//SCKL1583<space>3000280E018010000000C010000000401
00000006030820C7E202183088020218108802063C10880204341888012C26098FC12862
0D0801787E050801D843070800D8C106080089810207E
```

For more information on the CLI Icon format, refer to Sections 3.7 and 5.1.7 of the *Smart Messaging Specification 3.0.0* [7].

5.4 Example of a vCard

The following is an example of an electronic business card message format. The business card reader listens on Port 23F4 (hexadecimal) of a smart messaging capable mobile phone.

```
//SCKL23F4<space>BEGIN:VCARD[CRLF]FN:John
Smith[CRLF]TEL;FAX:+358400853588[CRLF]EMAIL:john.smith@nokia.com[CRLF]EN
D:VCARD[CRLF]
```

A vCard should include a formatted name field, a fax number, and an e-mail address.

5.5 Example of a vCalendar

The following is an example of a vCalendar message format. The vCalendar reader listens on Port 23F5 (hexadecimal) of a smart messaging capable mobile terminal. Notice that this example has been segmented into two messages and will require reassembly after transport.

```
//SCKL23F500E4340201<space>
BEGIN:VCALENDAR[CRLF]BEGIN:VEVENT[CRLF]CATEGORIES:PHONE
CALL[CRLF]DTSTART:19980420T130000[CRLF]
```

```
//SCKL23F500E4340202<space>
DTSTART:19980420T130000[CRLF]DESCRIPTION:+358405561424
[CRLF]AALARM:19980420T125500[CRLF]END:VEVENT[CRLF]END:VCALENDAR[CRLF]
```

Note: Most Nokia phones support vCard and vCalendar smart messages. The Internet Mail Consortium determines these specifications. The specifications for Electronic Calendar, Scheduling Exchange Format Specification, and the Electronic Business Card can be found at <http://www.imc.org>.

6 Terms and Abbreviations

Term or Abbreviation	Description
ANSI	American National Standards Institute
CDMA	Code Division Multiple Access
EIA	Electronic Industries Association
ETSI	European Telecommunication Standardization Institute
GUTS	Generic UDP Transport Service
IANA	Internet Author
IRA	International Reference Alphabet (IA5)
IP	Internet Protocol
LSB	Least Significant Bits
SMSC	Short Message Service Center
SMS	Short Message Service
MO	Mobile Originated
MSISDN	Mobile Subscriber ISDN (telephone number of device)
MS	Mobile Station
MSB	Most Significant Bits
MT	Mobile Terminated
TCP/IP	Transmission Control Protocol/Internet Protocol
TIA	Telecommunication Industry Association
UDH	User-Data Header (see GSM 03.40)
UDP	User Datagram Protocol
WAP	Wireless Application Protocol
WDP	Wireless Datagram Protocol
WSP	Wireless Session Protocol
WTP	Wireless Transaction Protocol

7 References

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