Nokia 9210 Communicator
High Speed Circuit Switched Data

NOKIA 9210
COMMUNICATOR
HSCSD

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1. ABOUT THIS DOCUMENT

This document provides some general information about the high-speed mobile technology called High Speed Circuit Switched Data (HSCSD). The latter part of the document describes how the HSCSD services can be used with the Nokia 9210 Communicator.

2. HIGH SPEED CIRCUIT SWITCHED DATA, HSCSD

2.1 Introduction to HSCSD

HSCSD is a high-speed data transfer technology, approved and specified by ETSI in February 1997. Due to the growth and popularity of mobility, a need has arisen for a technology that provides high-speed access to data services. Flexible and fast access to data sources with a mobile device requires higher transmission speeds than the basic 9.6 kbps and 14.4 kbps.

Circuit switched connections are used in fixed networks for speech and data. A circuit switched connection occupies one line for as long as the connection exists, as in voice phone calls for example. This is the optimum way of connecting when there is a continuous stream of data to be transmitted. HSCSD uses a channel coding scheme to boost the speed of one time-slot from 9.6 kbps to 14.4 kbps. HSCSD also provides the possibility of combining these time-slots so that there is a variety of new bitrates, ranging from 9.6 kbps up to 57,6 kbps. Higher transfer speeds are achieved by reserving multiple GSM time-slots for a single user.

HSCSD provides the possibility of using different data rates in the uplink and downlink directions. The term "uplink" is used when discussing data transfer from the terminal to the network. The term "downlink" means the opposite; in other words, it refers to data transfer from the network to the terminal. This feature is useful when downloading large web pages and having a lot of data travelling from the server to the terminal, for example. All three time-slots can be allocated in the downlink direction but just one 14.4 kbps time-slot is enough in the uplink direction. This kind of transfer is called asymmetrical service and in this case it is 3+1 time-slot service.

2.2 Benefits of HSCSD

HSCSD offers a number of benefits both to the mobile operator and subscriber. The operator benefits from higher bitrates without having to redesign its GSM network or making any major investments in the network infrastructure. A notable benefit is also the fact HSCSD puts wireless GSM data on a par with wireline data, that is, with PSTN modem services.

From the user´s point of view the most important feature is the increased speed. This makes connection times shorter and the use of current applications faster and more convenient. Data connections can be up to six times faster than they used to be and the use of such applications as mobile navigation services using maps and graphics comes more attractive. One important factor is that there is no need to learn any new technology since HSCSD is very similar to the 9.6 kbps service.

2.3 Applications requiring HSCSD

HSCSD provides both transparent and non-transparent services because applications have different service type requirements. For example fax and video applications require a transparent service offering constant bitrates and transmission delay. On the other hand, applications such the WWW and e-mail can work well with non-transparent services.

Some examples of applications that require fast data transfer speed are:

- e-mail sending and receiving
- WWW browsing
- remote corporate LAN access
- file transfer
- real-time applications
- time-critical wireless imaging
- mobile videophony

3. HSCSD SERVICES IN THE NOKIA 9210 COMMUNICATOR

3.1 Uplink/downlink speeds

Nokia 9210 Communicator supports both normal single-slot GSM data calls (using either 9.6 kbps or 14.4 kbps speed) and HSCSD multi-slot GSM data calls. Theoretical maximum uplink and downlink speeds of HSCSD are 43.2 kbps and 14.4 kbps (3+1 time-slot service) and 28.8 kbps and 28.8 kbps (2+2 time-slot service). The support for HSCSD call features depends on the GSM network and the user´s subscription to network services. The services may not be available in all networks in all areas or they might require a separate subscription.

Available HSCSD connection speeds are:

Remote modem type	1 time slot	2 time slots	3 time slots
Analog	9.6kbps - 14.4 kbps	19.2 kbps - 28.8 kbps	Not available
ISDN v.110	9.6kbps - 14.4 kbps	19.2 kbps - 28.8 kbps	28.8 kbps - 38.4 kbps
ISDN v.120	9.6kbps - 14.4 kbps	19.2 kbps - 28.8 kbps	28.8 kbps - 43.2 kbps

3.2 HSCSD settings

HSCSD settings are defined in “Advanced Settings for IAP: Data Call”. Options for *Connection type* are “Normal” and “High speed”. "Normal" represents a normal single time-slot GSM data call and the connection speed can be either 9.6 kbps or 14.4 kbps. The maximum connection speed is defined by *Max. connection speed.*

3.3 AT commands

AT strings are used to configure the internal modem of the Nokia 9210 Communicator. AT commands can be typed in *Modem init string* which is an option in “Advanced Settings for IAP: Data Call”. It should be noticed that, normally, when making an HSCSD call, there is no need to use AT commands. AT commands are meant for situations when the speed values of *Max. connection speed* are not

enough. AT command syntax can be found in Appendix 1. Examples of AT commands for making an HSCSD call are presented in the table below:

	Connection type
Wanted air interface user rate	**Analog**
9.6 kbps	AT+CBST=0,0,1;+CHSN=1,0,0,0
14.4 kbps	AT+CBST=0,0,1;+CHSN=2,0,0,0
19.2 kbps	AT+CBST=0,0,1;+CHSN=3,0,0,0
28.8 kbps	AT+CBST=0,0,1;+CHSN=4,0,0,0
43.2 kbit/	AT+CBST=0,0,1;+CHSN=6,0,0,0

	Connection type
Wanted air interface user rate	**v.110**
9.6 kbps	AT+CBST=81,0,1;+CHSN=1,0,0,0
14.4 kbps	AT+CBST=81,0,1;+CHSN=2,0,0,0
19.2 kbps	AT+CBST=81,0,1;+CHSN=3,0,0,0
28.8 kbps	AT+CBST=81,0,1;+CHSN=4,0,0,0
43.2 kbit/	AT+CBST=81,0,1;+CHSN=6,0,0,0

	Connection type
Wanted air interface user rate	**v.120**
9.6 kbps	AT+CBST=51,0,1;+CHSN=1,0,0,0
14.4 kbps	AT+CBST=51,0,1;+CHSN=2,0,0,0
19.2 kbps	AT+CBST=51,0,1;+CHSN=3,0,0,0
28.8 kbps	AT+CBST=51,0,1;+CHSN=4,0,0,0
43.2 kbit/	AT+CBST=51,0,1;+CHSN=6,0,0,0

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4. APPENDICES

4.1 AT command syntax

+CBST Select bearer service type

	Command	Response	Default
Set	+CBST=<speed>, <name>,<ce>		0,0,1
Read	+CBST?	+CBST: <speed>,<name>,<ce>	
Test	+CBST=?	+CBST: (0-7,12,14-16,34,36,38,39,43,47-51,65,66,68,70,71,75,79-81, (0,2),(0,3)	

Description: the +CBST command selects the bearer service with data rate, and the connection element to be used when data calls are originated. Values may also be used during mobile terminated data call setup, particularly in the case of single numbering scheme calls.

Defined values:

<speed>:

0	autobauding (automatic selection of the speed; this setting is possible with a 3.1 kHz modem and non-transparent service)
1	300 bps (v.21)
2	1200 bps (v.22)
3	1200/75 bps (v.23)
4	2400 bps (v.22bis)
5	2400 bps (v.26ter)
6	4800 bps (v.32)
7	9600 bps (v.32)
12	9600 (v.34)
14	14400 bps (v.34)
15	19200 bps (v.34)
16	28800 bps (v.34)
34	1200 bps (v.120)
36	2400 bps (v.120)
38	4800 bps (v.120)

39	9600 bps (v120)
43	14400 bps (v.120)
47	19200 bps (v.120)
48	28800 bps (v.120)
49	34800 bps (v.120)
50	48000 bps (v.120)
51	56000 bps (v.120)
65	300 bps (v.110)
66	1200 bps (v.110)
68	2400 bps (v.110 pr x.31 flag stuffing)
70	4800 bps (v.110 pr x.31 flag stuffing)
71	9600 bps (v.110 pr x.31 flag stuffing)
75	14400 bps (v.110 pr x.31 flag stuffing)
79	19200 bps (v.110 pr x.31 flag stuffing)
80	28800 bps (v.110 pr x.31 flag stuffing)

<name>:

0	Data circuit asynchronous (UDI or 3.1 kHz modem)
2	PAD Access (asynchronous) (UDI)

<ce>:

0	Transparent
1	Non-transparent
2	Both, transparent preferred
3	Both, non-transparent preferred

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+CHSD HSCSD device parameters

	Command	Response	+cme error
execute	+CHSD	+CHSD: <mclass>,<maxRx>,<maxTx>,<sum>,<codings>	x
test	+CHSD=?		

Parameters:

<mclass>: integer type; multislot class

<maxRx>: integer type; maximum number of receive timeslots that ME can use

<maxTx>: integer type; maximum number of transmit timeslots that ME can use

<sum>: integer type; total number of receive and transmit timeslots that ME can use at the same time (per TDMA frame). The following applies in a HSCSD call:
1£ (receive slots) + (transmit slots) £ <sum>

<codings>: is a sum of integers each representing a supported channel coding

4 9.6k full rate data traffic channel

8 14.4k full rate data traffic channel

12 both 9.6k and 14.4k supported

+CHSN parameter command syntax

	Command	Response	+cme error
execute	+CHSN= [<wAiur> [,<wRx> [, <topRx> [, <codings>]]]]	+CHSN: <wAiur>,<wRx>,<topRx>,<codings>	x
test	+CHSN=?	+CHSN: (1-6), (1-3), (0-3), (4,8)	

Description: Set command controls parameters for non-transparent HSCSD calls.

Defined values:

<wAiur>: integer type; wanted air interface user rate. Default 0 indicates that TA shall calculate a proper value form currently selected fixed network user rate (<speed> subparameter from +CBST command), <codings> and <wRx< (or <maxRx> form +CHSD command if <wRx=0). Other values:

1 9600 bps

2 14400 bps

3 19200 bps

4 28800 bps

6	43200 bps
<wRx>:	integer type; wanted amount of receive timeslots. Default value 0 indicates that TA shall calculate a proper value from currently selected <wAiur> and <codings>
<topRx>:	integer type; top value for <wRx> that user is going to request during the next established non-transparent HSCSD call. Default value 0 indicates that user is not going to change <wAiur>/<wRxz> during next call
<codings>:	a sum of integers each representing a channel coding that is accepted for transparent HSCSD calls. Default value 0 indicates that all supported codings are accepted (refer +CHSD command for other values)
<codings>:	a sum of integers each representing a supported channel coding:
4	9.6k full rate data traffic channel
8	14.4k full rate data traffic channel
12	Both 9.6k and 14.4k supported