



cdma2000 Multimedia Services Evaluation Methodology: Software Tools

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Revision History

Revision	Description of Changes	Date
Rev 0 v1.0	Initial Publication	January 2007
<u>Rev 0 v2.0</u>	<u>Addition of Two Video Test Sequences</u>	<u>December 2011</u>

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(This foreword is not part of this document.)

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1 INTRODUCTION

1.1 Scope

This technical report explains how to use C.R1009 software tools, which are supplemental to this technical report.

1.2 Requirements Language

“Shall” and “shall not” identify requirements to be followed strictly to conform to this document and from which no deviation is permitted. “Should” and “should not” indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others, that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is discouraged but not prohibited. “May” and “need not” indicate a course of action permissible within the limits of the document. “Can” and “cannot” are used for statements of possibility and capability, whether material, physical or causal.

1.3 Informative References

3GPP2 C.R1008, *cdma2000 Multimedia Services Evaluation Methodology*.

1.4 Definitions, Symbols, and Abbreviations

This section contains definitions, symbols, and abbreviations that are used throughout the document.

1.4.1 Definitions

multimedia: a combination of multiple media elements used in a service to enrich the user experience.

1.4.2 Symbols and Abbreviations

3GPP2	Third Generation Partnership Project 2
BCMCS	Broadcast-Multicast Services
DLL	Dynamic Link Library
DRC	Data Rate Control
EVRC	Enhanced Variable Rate Codec
FER	Frame Error Rate
FL	Forward Link
HRPD	High Rate Packet Data
IP	Internet Protocol
ITU	International Telecommunications Union
LSB	Least Significant Bit
MAC	Medium Access Control
MPEG	Motion Picture Expert Group

1	MTU	Maximum Transmission Unit
2	NCIM	Network Client Interface Module
3	NB	Narrow Band
4	PDU	Packet Data Unit
5	RL	Reverse Link
6	RTP	Real-time Transport Protocol
7	S/W	Software
8	TTI	Transmission Time Interval
9	UDP	User Datagram Protocol
10	VoIP	Voice over Internet Protocol
11		

2 SIMULATION METHODOLOGY FOR MULTIMEDIA SERVICES: SOFTWARE TOOLS

2.1 General Description

This software distribution is in long filename format and will need to be initially downloaded onto a PC-Windows® platform, and the appropriate portions subsequently transferred to an appropriate platform for processing, depending on the software distribution contents. If the distribution is downloaded as compressed files from an ftp site, a free ~~26013.2~~ MB space will be required: ~~1002.2~~ MB for the compressed files and ~~16011~~ MB for the uncompressed distribution directory. The utilization of this software database is described in the parent referenced document **Error! Reference source not found..**

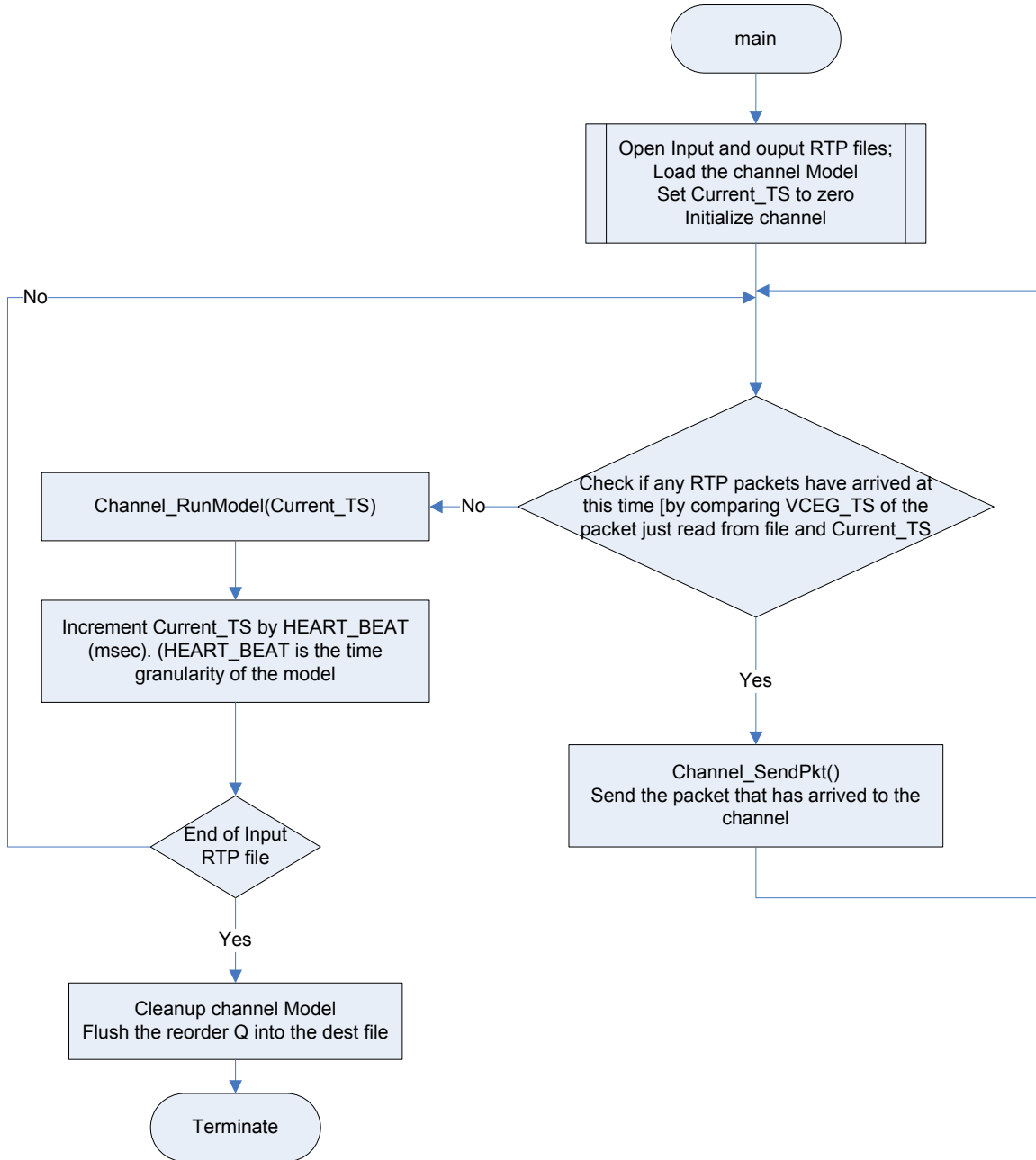
2.2 Simulation Methodology for Multimedia Services Software Distribution

The Software Distribution supporting the simulation methodology for multimedia services is contained in the compressed files accompanying this textual cover. The folder rtpsim contains source files. The channel model source files are located in the folder Channel. This page intentionally left blank.

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1 **3 RTPSIM SOFTWARE USAGE**

2 C.R1009 software tools presented in this technical report includes a module called
 3 RTPsim. The flowchart of RTPsim is shown in Figures 1 and 2.



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Figure 1: RTPsim functional flowchart

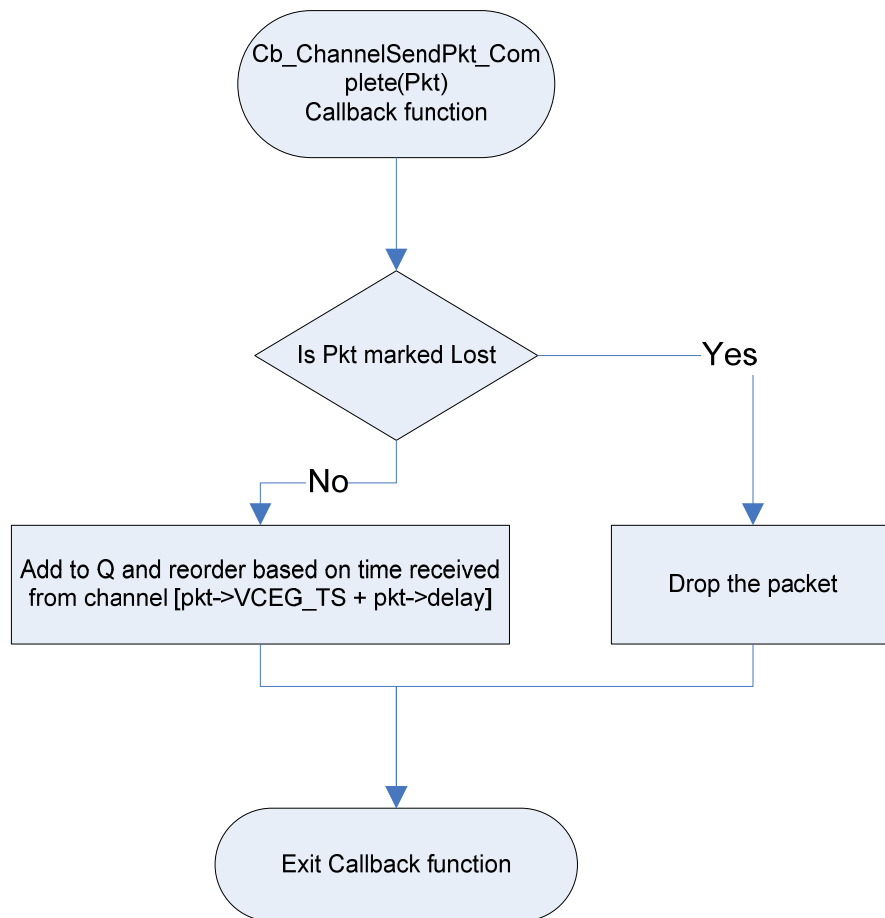


Figure 2: Channel_SendPkt ()

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RTPsim software can be run using 2 following commands as follows:

3.1 Separated channel model dynamic link library

DLL is built using Visual Studio .NET [Visual C++ 6 and 7] only. The software usage is as follows:

RTPsim.exe <Input File> <Output File> <Configuration File> <ChannelModel.dll>

Example of usage is as follows:

RTPsim.exe video_input.rtp video_output.rtp config.cfg channel.dll

Default DLL files (<ChannelModel.dll>) are channel_HRPDRL_video.dll, channel_HRPDFL_video.dll, DedicatedChannel.dll and Channel_HRPD_voip.dll for HRPD Reverse Link, Forward Link, Dedicated Channel and HRPD VoIP channels. The DLL file for each channel model is located in the folder RTPsim/bin.

3.2 Integrated channel model library

This section describes how to build RTPsim from command line, e.g., for Cygwin, Linux, and Unix. RTPsim executable containing static library is built using “make <ChannelModelName>” from command line where <ChannelModelName> can be one of the following: “HRPD_voip”, “HRPDFL_video”, “DedicatedChannel” or “HRPDRL_video”. “make all” will build all the channel models. Software usage is as follows:

RTPsim.exe <Input File> <Output File> <Configuration File>

Example of usage is as follows:

```
RTPsim.exe video_input.rtp video_output.rtp config.cfg
```

For both usages (DLL and Static library), the formats of the input file, the output file and the configuration file are provided in [1]. Log file defined in config.cfg captures per packet diagnostic information. Statistics file defined in config.cfg captures statistics such as:

1. total number of RTP packets,
2. number of lost RTP packets,
3. total number of bytes successfully transmitted,
4. total number of lost bytes,
5. total number of MAC packets,
6. number of lost MAC packet,
7. average channel delay (average of delay suffered by each RTP packet),
8. average channel throughput (application data + RoHC compressed IP/UDP/RTP headers), and
9. effective channel throughput (application data + IP/UDP/RTP headers).

Note: not all the statistics are captured for all channel models.

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4 CHANNEL MODELS

4.1 HRPD Video

4.1.1 Reverse Link

Token bucket parameters and probability models are provided inside the channel model source codes. Example of a configuration file for HRPD video reverse link is shown below.

```

6     LogFile           = "log.txt"      # Log File
7     StatFile          = "stat.dat"     # Statistics File
8     LossDelayProfile  = "hrpd.out"    # Unused
9     ErrorFreeRTP      = 0              # Number of error-free RTP packets
10    MaxE2EDelay       = 1000          # in msec & the value should be greater
11    than 0; drop packet in the channel if delayed more than this value
12    HeaderSize        = 28            # IP + UDP Header size in bytes
13    RoHCOffset        = 36            # reduction in header size due to RoHC in bytes

```

4.1.2 Forward Link

Example of a configuration file for HRPD video forward link is shown below. The DRC trace files are located in rtpsim/Traces/HRPD/HRPD_FL [1].

```

17    LogFile           = "log.txt"      # Log File
18    StatFile          = "stat.dat"     # Statistics File
19    LossDelayProfile  = "DRCtrace.dat" # DRC trace File
20    ErrorFreeRTP      = 0              # Number of error-free RTP packets
21    MaxE2EDelay       = 1000          # in msec & the value should be greater than
22    0; drop packet in the channel if delayed more than this value
23    HeaderSize        = 28            # IP + UDP Header size in bytes
24    RoHCOffset        = 36            # reduction in header size due to RoHC in bytes

```

4.2 Dedicated Channel

Example of a configuration file for dedicated channel for video is shown below. The error mask files are located in rtpsim/Traces/DedicatedChannel [1].

```

28    LogFile           = "log.txt"      # Log File
29    StatFile          = "stat.dat"     # Statistics File
30    LossDelayProfile  = "FER1_CM0_g6_AS1.rev" # Error mask
31    RandomSeed        = 0              # Random Seed
32    ErrorFreeRTP      = 0              # Number of error-free RTP packets

```

1	MaxE2EDelay	= 1000	# in msec & the value should be greater
2			than 0; drop packet in the channel if delayed more than this value
3	HeaderSize	= 28	# IP + UDP Header size in bytes
4	RoHCOffset	= 36	# reduction in header size due to RoHC
5			in bytes
6	PDUSize	= 160	# PDU size in Bytes
7	SlotTTI	= 20	# Slot duration

8 **4.3 BCMCS**

9 Basic BCMCS SiNR traces for channel model A are included in sinr/ModelA, and the traces
 10 for channel model D are included in sinr/ModelD. Also, sinr/ contains “data_rate_set.txt”
 11 which contains information needed to post-process SiNR traces. This information is listed
 12 below.

- 13 • DRC to rate map
- 14 • DRC to number of required slots map
- 15 • DRC to SiNR threshold map
- 16 • DRC to Doppler backoff map

17 Procedures to generate error traces using SiNR traces are described in Section 6.3 of [1].

18 **4.4 HRPD VoIP**

19 Followings are the steps to perform VoIP evaluation for the separated channel model case
 20 of section 3.1.

```
21 Preprocess_speech_trace.exe <Input delay profile (provided in the package under
22 directory rtpsim/Traces/HRPD/HRPD_VoIP)> <hrpd.out>
23 RTPpacketizer_EVRC <EVRC encoded file> <EVRC RTP packet file>
24 RTPsim.exe <input speech RTP packet file> <output speech RTP packet file>
25 <speech.cfg> <channel_HRPD_voip.dll>
26 NCIM.exe < output speech RTP packet file > <output decoded speech file>
```

27 For the integrated channel model case of section 3.2, following are the steps to perform
 28 VoIP evaluation.

```
29 Preprocess_speech_trace.exe <Input delay profile (provided in the package under
30 directory rtpsim/Traces/HRPD/HRPD_VoIP)> <hrpd.out>
31 RTPpacketizer_EVRC <EVRC encoded file> <EVRC RTP packet file>
32 RTPsim_HRPD_voip.exe <input speech RTP packet file> <output speech RTP packet
33 file> <speech.cfg>
34 NCIM.exe < output speech RTP packet file > <output decoded speech file>
```

```
1 Example speech.cfg
2     LogFile           = "log.txt"      # Log File
3     StatFile          = "stat.dat"     # Statistics File
4     LossDelayProfile  = "hrpd.out"     # contains delay and loss statistics
5     ErrorFreeRTP      = 0              # Number of error-free RTP packets
6     MaxE2EDelay       = 1000          # in msec & the value should be greater
7     than 0; drop packet in the channel if delayed more than this value
8     HeaderSize        = 28            # IP + UDP Header size in bytes
9     RoHCOffset        = 36            # reduction in header size due to RoHC in bytes
```