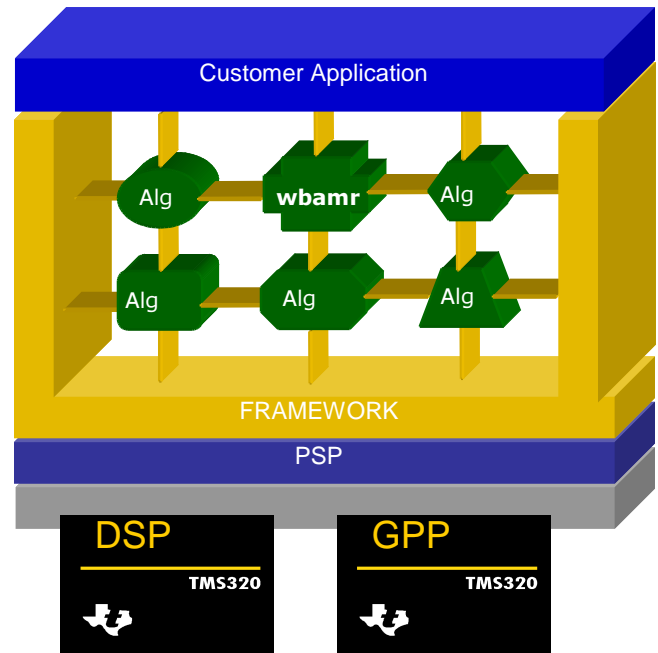




- Mixed C and C64x+ assembly code implementation
- XDAIS compliant
- Bit-exact with 3GPP GSMWBAMR Reference C code on all test sequences
- Compliant with the eXpressDSP Multimedia (XDM) interface



description

- The GSMWBAMR (Wideband Adaptive Multi_Rate) codec is based on Code Excited Linear prediction (CELP) algorithm.
- It encodes frames of 20 ms sampled at 16KHz (320 samples) using CELP algorithm
- The code is bit exact with 3GPP WBAMR ANSI C Code 26.173 v 6.0.0 and is tested with 3GPP WBAMR reference test vectors 26.174 v 6.0.0.
- Fully validated on C6455 hardware, using CCS version 4.2 with the code generation tools version 7.2.0A10197
- Supports Interface Format 1 (with and without CRC Computation) and Interface Format 2 as specified by 26.201 (WBAMR speech codec frame structure) v 6.0.0.
- Supports MMS_IO Packing Format as specified by 3GPP WBAMR ANSI C Code 26.173 v 6.0.0 & RFC3267 Section 5.3
- Supports both Little and Big Endian Mode of operation
- The GSMWBAMR Codec has an Interrupt Latency of less than 4000 cycles
- Compliant with the eXpressDSP Multimedia (XDM) interface
- This codec is supported on any C64x+ based devices like C6455, TCI6482, DM648/647, TNETV2685, DM6437 etc
- Supports both ELF and COFF format's



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summary of performance

Table 1. Configuration Table

CONFIGURATION	ID
Encoder with VAD Status ON (Little Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_001
Decoder (Little Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_002
Full Duplex (Little Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_003
Encoder with VAD Status ON (Big Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_004
Decoder (Big Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_005
Full Duplex (Big Endian) on C6455 hardware with 32KB L1P, 32KB L1D, Program & Data in L2 and Cache flushed every frame	WBAMR_006

Table 2. Cycles Information – Profiled on C6455 (TCI6482) Platform(COFF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES /SEC) ¹	
	AVERAGE	PEAK
WBAMR_001	-	13.07
WBAMR_002	-	3.17
WBAMR_003	-	16.24
WBAMR_004	-	12.98
WBAMR_005	-	3.21
WBAMR_006	-	16.19

¹Measured with frame size= 320 samples (20ms)

Table 3. Cycles Information – Profiled on C6455 (TCI6482) Platform(ELF Library)

CONFIGURATION ID	PERFORMANCE STATISTICS (IN MEGACYCLES /SEC) ¹	
	AVERAGE	PEAK
WBAMR_001	-	13.07
WBAMR_002	-	3.17



WBAMR_003	-	16.24
WBAMR_004	-	12.98
WBAMR_005	-	3.21
WBAMR_006	-	16.19

Measured with frame size= 320 samples (20ms)

Table 4. Memory Statistics - Generated with Code Generation Tools Version 7.2.0A10197(COFF Library)

CONFIGURATION	MEMORY STATISTICS ²				
	PROGRAM MEMORY	DATA MEMORY			TOTAL
		INTERNAL	EXTERNAL	STACK	
WBAMR_001	97.84	38.057	0	1.100	136.99
WBAMR_002	49.44	31.791	0	0.600	81.83
WBAMR_003	131.68	39.580	0	1.100	172.36
WBAMR_004	97.10	38.057	0	1.100	136.25
WBAMR_005	49.10	31.791	0	0.600	81.49
WBAMR_006	130.79	39.580	0	1.100	171.47

² All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes).

Table 5. Memory Statistics - Generated with Code Generation Tools Version 7.2.0A10197(ELFF Library)

CONFIGURATION	MEMORY STATISTICS ²				
	PROGRAM MEMORY	DATA MEMORY			TOTAL
		INTERNAL	EXTERNAL	STACK	
WBAMR_001	97.84	38.057	0	1.100	136.99
WBAMR_002	49.44	31.791	0	0.600	81.83
WBAMR_003	131.68	39.580	0	1.100	172.36
WBAMR_004	97.10	38.057	0	1.100	136.25
WBAMR_005	49.10	31.791	0	0.600	81.49
WBAMR_006	130.79	39.580	0	1.100	171.47

² All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes).

Table 6. Internal Data Memory Split-up

CONFIGURATION	DATA MEMORY – INTERNAL ³		
	SHARED		INSTANCE ⁴
	CONSTANTS	SCRATCH	
WBAMR_001 & WBAMR_004	26.596	8.711	2.750

GSMWBAMR ON TMS320C64X+



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WBAMR_002 & WBAMR_005	26.596	3.672	1.523
WBAMR_003 & WBAMR_006	26.596	8.711	4.273

³ All memory requirements are expressed in kilobytes (1 kilobyte = 1024 8-bit bytes)

⁴ Does not include I/O buffers



notes

- I/O Buffers – Encoder: Input Buffer Size = 640 bytes, Output Buffer Size (maximum) = 112 bytes for GSMWBAMR_PARAMETER_FORMAT, 63 bytes for Interface Format 1, 61 bytes for Interface Format 2 & MMS_IO packing format
- I/O Buffers – Decoder: Input Buffer Size (maximum) = 112 or 63 or 61 bytes, Output Buffer Size = 640 bytes.
- All I/O Buffers should be half-word (16-bit) aligned.
- The Cycles information presented in Table 2 is with Frame Format selected as Interface Format 1 with CRC Computation. This is the most cycle intensive frame format.

References

- 3GPP TS 26.171 V6.0.0: AMR Wideband Speech CODEC; General Description
- 3GPP TS 26.173 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; ANSI C Source Code
- 3GPP TS 26.174 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Test Sequences
- 3GPP TS 26.190 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Transcoding Functions
- 3GPP TS 26.191 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Error Concealment of Lost Frames
- 3GPP TS 26.192 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Comfort Noise Aspects
- 3GPP TS 26.193 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Source Controlled Rate Operation
- 3GPP TS 26.194 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Voice Activity Detector (VAD)
- 3GPP TS 26.201 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Frame Structure
- 3GPP TS 26.202 V.6.0.0: Adaptive Multi-Rate Wideband Speech Codec; Interface to Iu, Uu and Nb

glossary

Constants	Elements that go into gsmwbamrtable1 to gsmwbamrtable10 memory section
Scratch	Memory space that can be reused across different instances of the algorithm
Shared	Sum of Constants and Scratch
Instance	Persistent-memory that contains persistent information – allocated for each instance of the algorithm

acronyms

GSM	Global System for Mobile Communication
WBAMR	Wideband Adaptive Multi-Rate
VAD	Voice Activity Detector



REVISION HISTORY

Scope: Applicable updates to the GSMWBAMR on TMS320C64X+ have been incorporated.

DATE	VERSION	ADDITIONS/CHANGES/DELETIONS
February 22, 2006	1.0	Initial Version
Aug 21, 2006	1.01	Updated the document for Big Endian data
April 25, 2007	1.10	Updated with OMAP2430 release
June, 2008	1.11	xDM1.0 release with makefile based build procedure
January 2012	2.0	Updated with cgttools 7.2.0A10197 for COFF and ELF libraries

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