User's Manual

32

OMX Media Component

User's Manual: VC-1 Video Decoder Part

— Preliminary —

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1. Overview

1.1. About This Document

This document is the User's Manual for OMX Media Component. It describes the specifications of VC-1 Video Decoder Media Component. For the specifications that are common to OMX video decoder, see related documents [1] and [2].

1.2. VC-1 Video Decoder Media Component Overview and Scope

Figure 1-1 illustrates the software stacks for the VC-1 Video Decoder Media Component and shows the scope of this document. OMX Media Component VC-1 Video Decoder Library is a library that provides VC-1 Video decoding functions. It requires OMX Media Component Video Decoder Common Library and OMX Media Component Common Library.

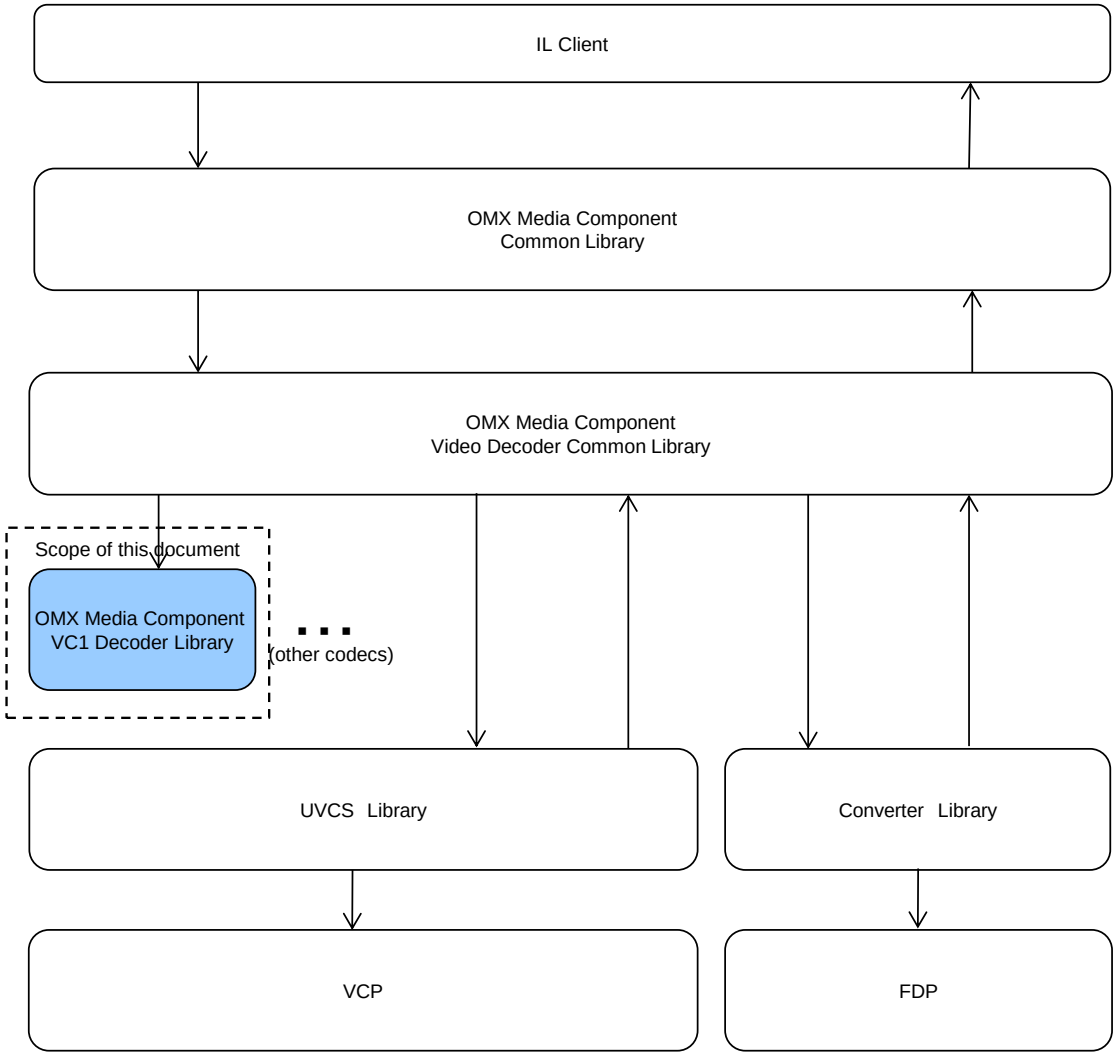

Figure 1-1 Software Stacks and Scope

This document describes the specifications of OMX Media Component VC-1 Video Decoder library part. For the specifications of OMX Media Component Video Decoder Common Library and OMX Media Component Common Library, see related documents [1] and [2] respectively.

1.3. Required Header Files

Table 1-1 lists the header files that are required to use the OMX extended indexes and structures that are described in this document. Regarding the other header files, see related documents [1] and [2].

Table 1-1 Required Header Files

File name	Remarks
OMXR_Extension_vc1.h	-
OMXR_Extension_vc1d.h	-

1.4. Role Name and Component Name

Table 1-2 shows the role name and the component name for VC-1 Video Decoder Media Component.

Table 1-2 Role Name and Component Name

Role name	Component name
video_decoder.vc1	OMX.RENESAS.VIDEO.DECODER.VC1

1.5. Related Documents

Table 1-3 lists the related documents.

Table 1-3 List of Related Documents

No.	Document Name	Remarks
[1]	OMX Media Component User's Manual Common Part	The common specifications for OMX Media Component
[2]	OMX Media Component User's Manual Video Decoder Common Part	The common specifications for OMX Video Decoder Media Component
[3]	OpenMAX Integration Layer Application Programming Interface Specification Version 1.1.2, September 1, 2008	http://www.khronos.org/registry/omxil/specs/OpenMAX_IL_1_1_2_Specification.pdf
[4]	OMX Integration Guide for <OS >	Integration guide for OMX Media Component. Substitute <OS> with your target operating system name.

1.6. Terminology

Table 1-4 lists the terms that are used in this document.

Table 1-4 Terminology

Term	Abbreviation	Description
Video Port Base	VPB	The base value of the port index of the Video Media Component. The port index values of the input and output ports are obtained by adding offset values to this base value.
UVCS	-	Renesas proprietary video codec software module that provides multi-processing function for video decoding and encoding. OMX Video Codec products contain UVCS library.

2. Functions

VC-1 Video Decoder Media Component is a media component which provides functions to decode video stream that is compressed according to the VC-1 standard. VC-1 Video Decoder Media Component receives encoded stream data on the input port and emits the decoded video frame data on the output ports.
For the specifications that are common to OMX video decoders, see related document [2].

2.1. Function Details

2.1.1. Decode Functions

Table 2-1 shows the codec standard and functions that VC-1 Video Decoder Media Component supports.

Table 2-1 Supported Codec Standard and Functions

Codec standard	SMPTE 421M
Profile	Simple / Main / Advanced
Level	Low / Medium (Simple Profile) Low / Medium / High (Main Profile) L0 / L1 / L2 / L3 (Advanced Profile)
Unsupported tools	-
Picture size	<Progressive> Note1 - Width : 80 - 1920 (must be multiple of 2) - Height : 80 - 1088 (must be multiple of 2) <Interlace> Note1 - Width : 80 - 1920 (must be multiple of 2) - Height : 80 - 1088 (must be multiple of 4)
Bit rate	Maximum 40Mbits/s Note2
Frame rate	Maximum 60p / 60i Note2
Input format	RCV Ver.2 Format VC-1 Elementary Stream Format
Output format	YUV420 Semi-Planar format YUV420 Planar format

Note1: The allowable width and height are 1920 and the maximum number of macroblocks per picture is up to 8160 that is equals to the one of 1920x1088 stream. Therefore, 1088x1920 stream is supported.

Note2: Regarding the throughput, the following description should be noticed:
- The maximum throughput is different for each LSI. For the detail, see the LSI hardware manual.
- The throughput may fall depends on CPU load and bus traffic caused by modules except OMX Media Component.

3. I/O Data Format

3.1. Buffer Payload

3.1.1. Input Buffer Payload

The input data format of VC-1 Video Decoder Media Component depends on the profile of an input stream. Thus, IL client shall be aware of the profile before the video decoding.

(1) For Simple and Main Profile

- The input data unit is one frame data.
- The Sequence Layer Structure and a frame data must be stored in separate buffers. OMX_BUFFERFLAG_CODECCONFIG must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure of a buffer contains the Sequence Layer Structure. For details of Sequence Layer Structure, see section 3.2.
- If an input data starts with Frame Header, set ‘8’ to the *nOffset* member of the OMX_BUFFERHEADERTYPE structure. Otherwise, set ‘0’ to the member.
- OMX_BUFFERFLAG_ENDOFFRAME must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure only when a buffer payload contains the last data of a frame data.
- When input is the end-of-stream, OMX_BUFFERFLAG_EOS must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure. For the details of OMX_BUFFERFLAG_EOS, see related document [2].

ATTENTION:
- There is a performance disadvantage to store a frame data into multiple buffers. Therefore IL client should store a frame data into a single buffer.

(nFlags)
CONFIG : OMX_BUFFERFLAG_CODECCONFIG
EOF : OMX_BUFFERFLAG_ENDOFFRAME

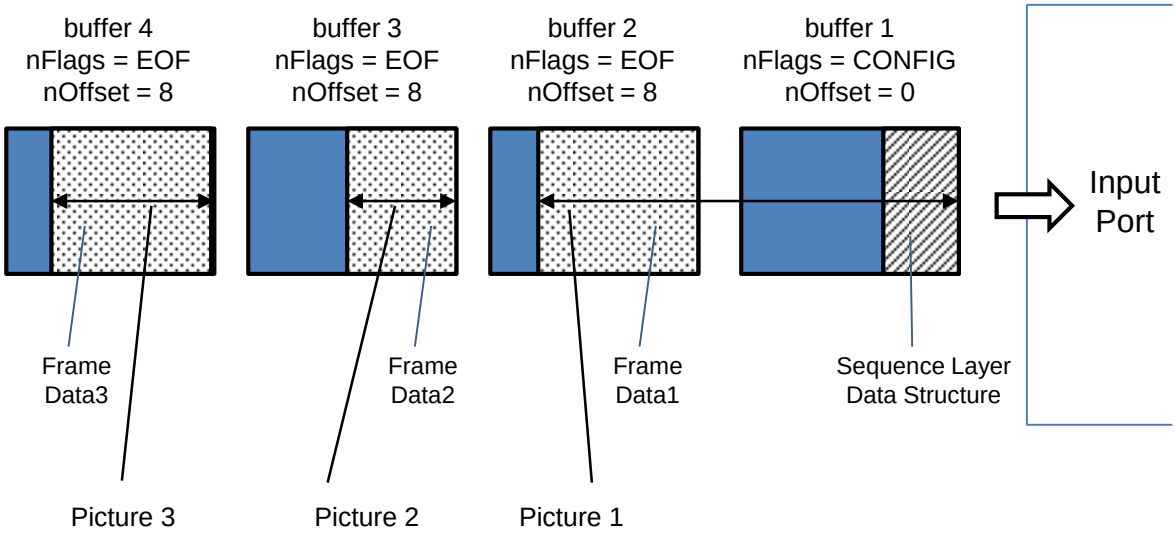

Figure 3-1 Example of Input Buffer Sequence - A Frame Data Unit (SP and MP)

(2) For Advanced Profile

- The input data unit is one picture data that is defined as either of the following:
  - A frame data of progressive contents (see Figure 3-2)
  - An interlaced field (see Figure 3-3)
  - A pair of interlaced fields (see Figure 3-4)

- In the case where the Sequence Header and the Entry Point Header are stored in separate buffers, OMX_BUFFERFLAG_CODECCONFIG must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure of a buffer contains the Sequence Header or the Entry Point Header (see Figure 3-5, Figure 3-6).

- OMX_BUFFERFLAG_ENDOFFRAME must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure only when a buffer payload contains the last data of a picture data.

- When an input is the end-of-stream, OMX_BUFFERFLAG_EOS must be set in the *nFlags* member of the OMX_BUFFERHEADERTYPE structure. For the details of OMX_BUFFERFLAG_EOS, see related document [2].

ATTENTION:
- There is a performance disadvantage to divide one picture data into multiple buffers. Therefore IL client should store one picture data into a single buffer.

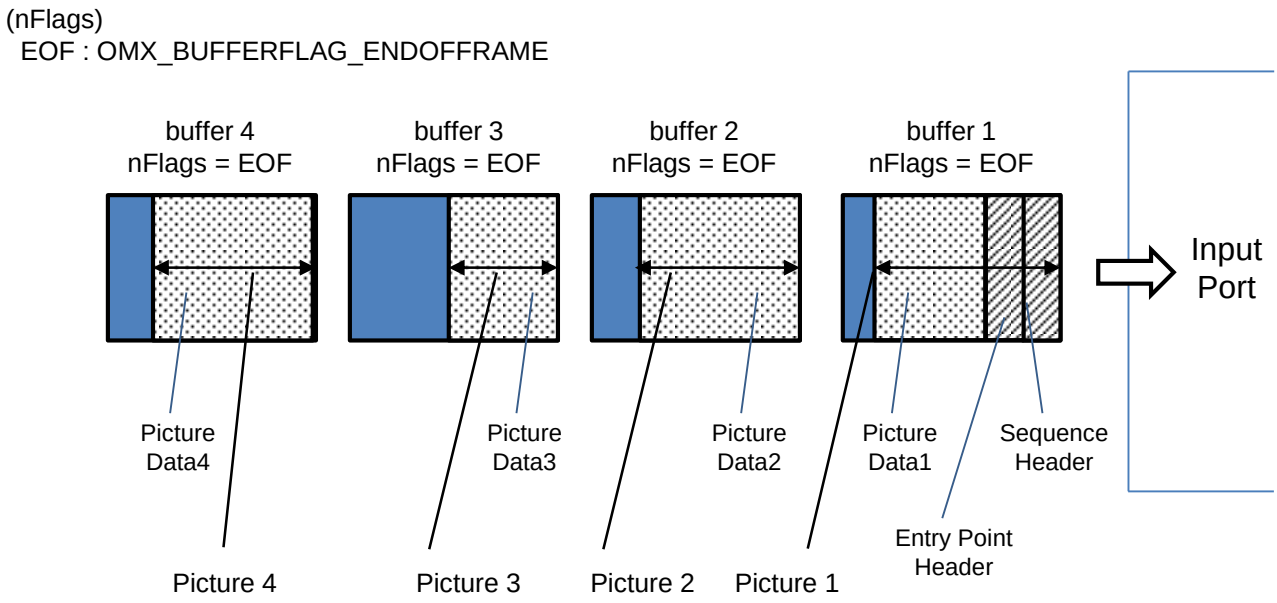

Figure 3-2 Example of Input Buffer Sequence – A Frame Data Unit (AP)

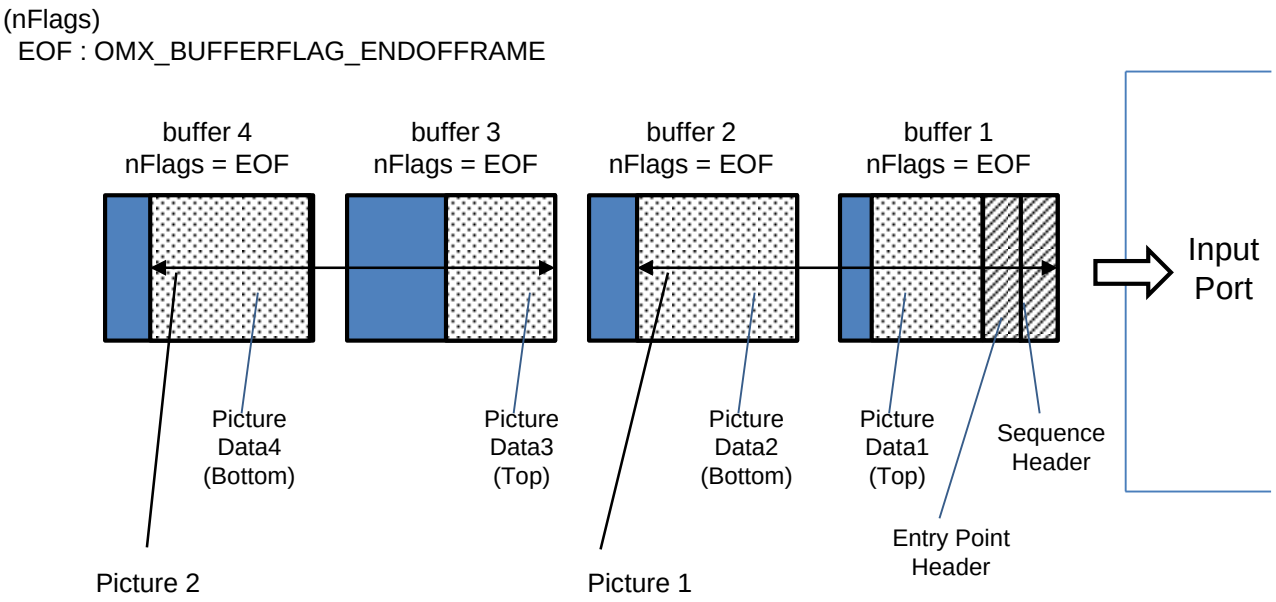

Figure 3-3 Example of Input Buffer Sequence – An Interlaced Field Unit

(nFlags)
EOF : OMX_BUFFERFLAG_ENDOFFRAME

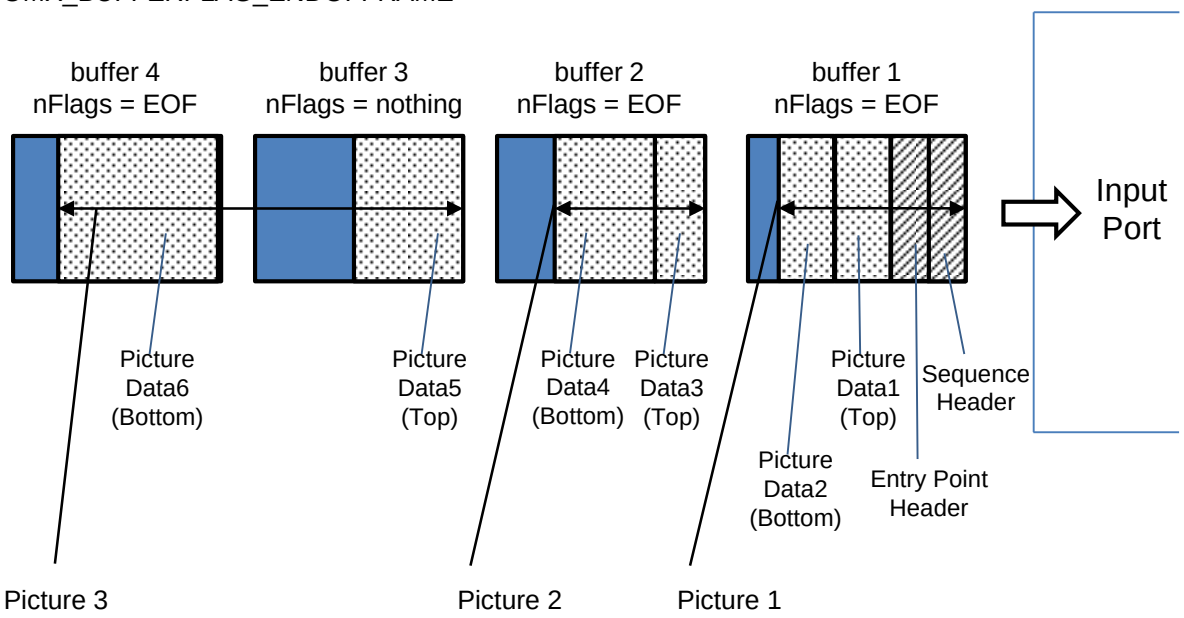

Figure 3-4 Example of Input Buffer Sequence – A Pair of Interlaced Fields Unit

(nFlags)
CONFIG : OMX_BUFFERFLAG_CODECCONFIG
EOF : OMX_BUFFERFLAG_ENDOFFRAME

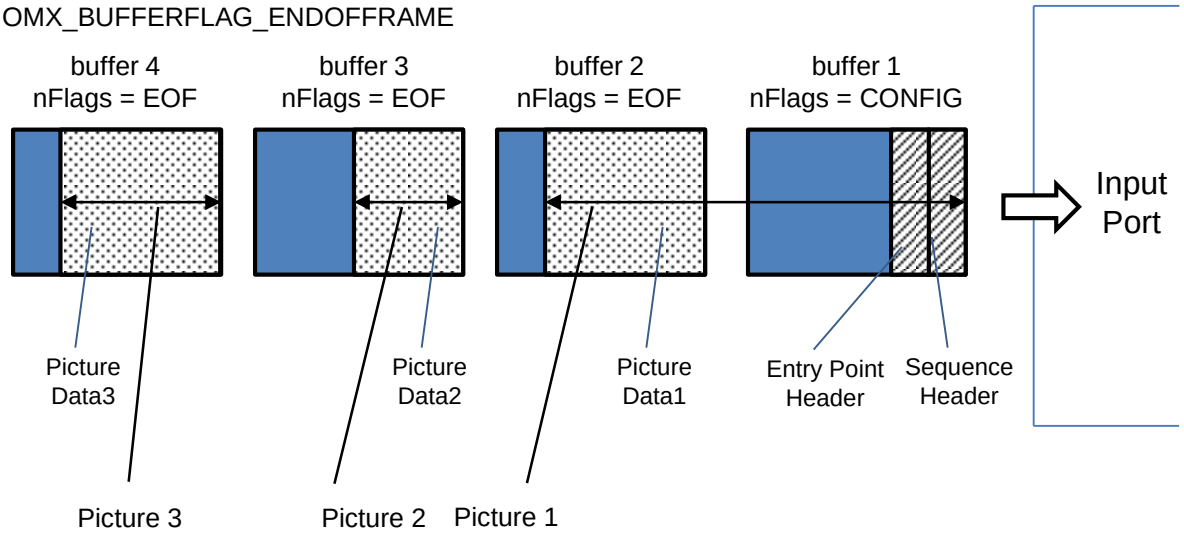

Figure 3-5 Example of Input Buffer Sequence – Sequence Header and Entry Point Header in the Same Buffer

(nFlags)
CONFIG : OMX_BUFFERFLAG_CODECCONFIG
EOF : OMX_BUFFERFLAG_ENDOFFRAME

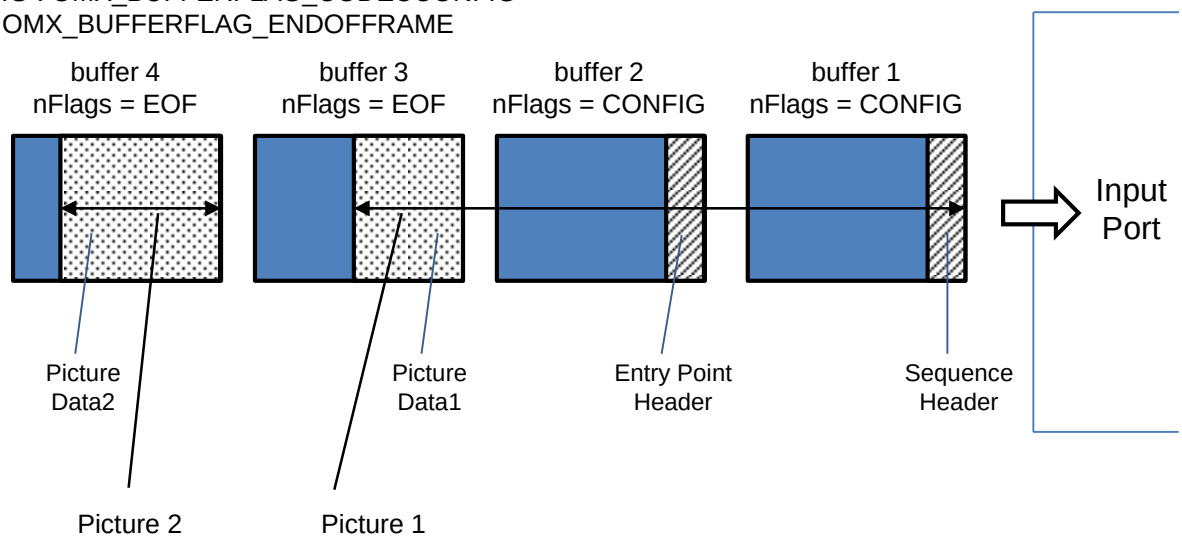

Figure 3-6 Example of Input Buffer Sequence – Sequence Header and Entry Point Header in Different Buffers

3.1.2. Output Buffer Payload

See related document [2].

3.2. Input Stream Data Format

(1) RCV V2.0 Format for Simple and Main Profiles

Figure 3-7 illustrates the input stream data format of the RCV V2.0 format of Simple and Main profiles.

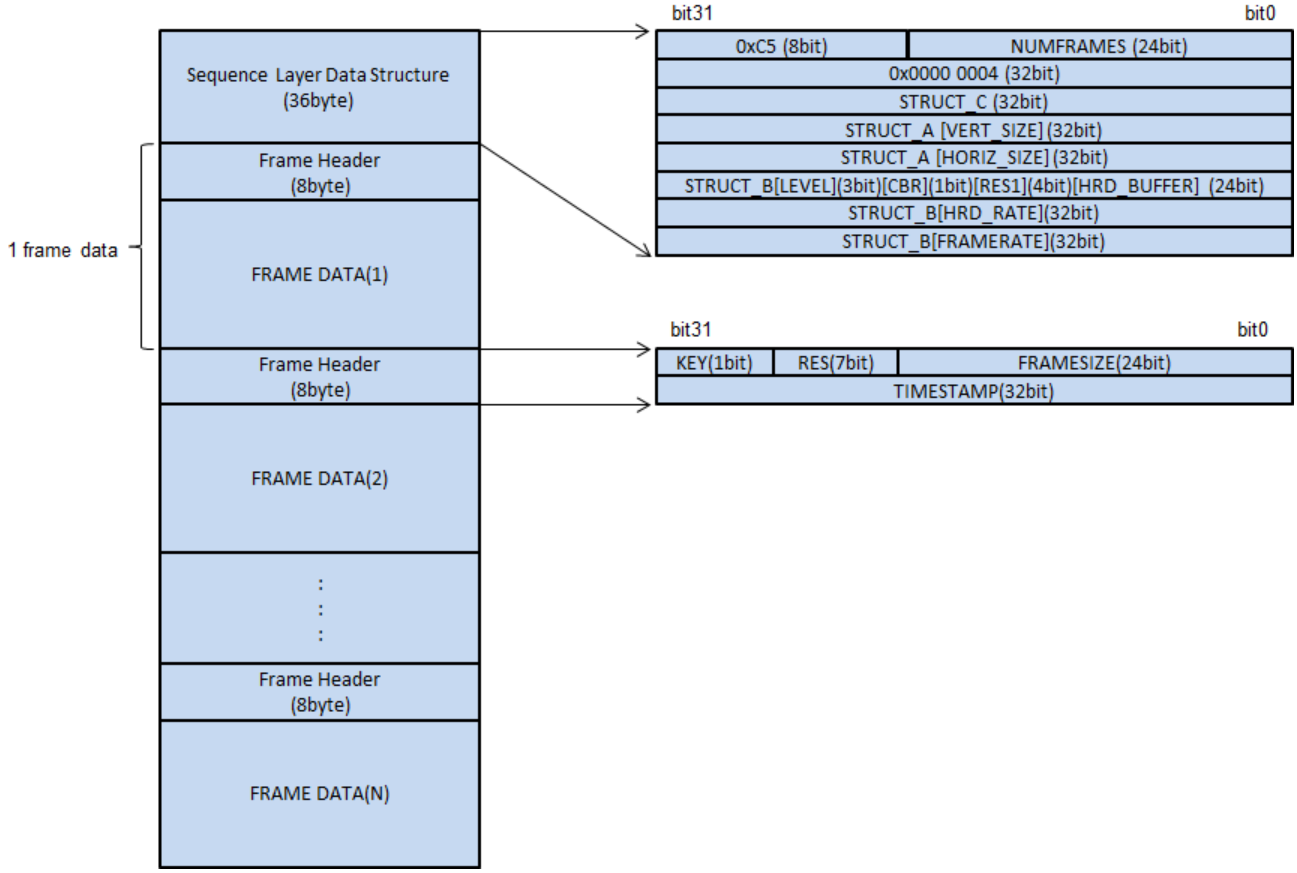

Figure 3-7 Input Stream Data Format for SP/MP (RCV Ver.2 Format)

Table 3-1 describes the member of the Sequence Layer Data Structure. For the details of each structure, refer to the VC-1 standard.

Table 3-1 : Sequence Layer Data Structure

STRUCT Name	Mandatory	Note
STRUCT_C	YES	-
STRUCT_A	YES	-
STRUCT_B	NO	When there is no STRUCT_B in the contents, the IL Client must not input STRUCT_B data to OMX Media Component.

(2) Elementary Stream for Simple and Main Profiles

Figure 3-8 illustrates the input stream data format of the Elementary Stream of Simple and Main profiles. The sequence Layer Data Structure that is described in (1) must be input at the top of the decoding. Therefore, the IL client needs to prepare the Sequence Layer Data Structure by using such as the header information of the container.

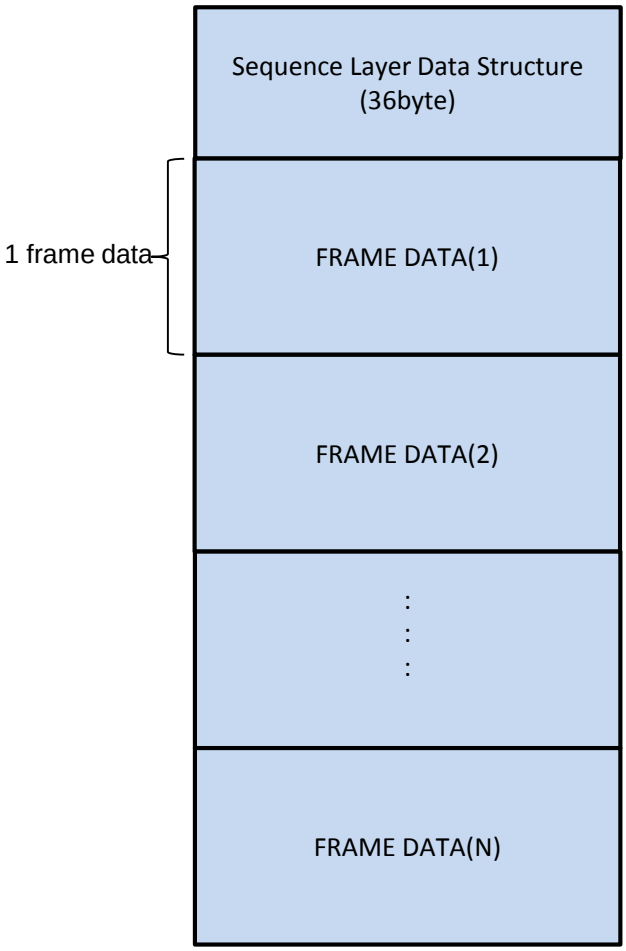

Figure 3-8 Input Stream Data Format for SP/MP (Elementary Stream Format)

(3) Elementary Stream for Advanced Profile

Figure 3-9 illustrates the input stream data format of the Elementary Stream of Advanced profile.

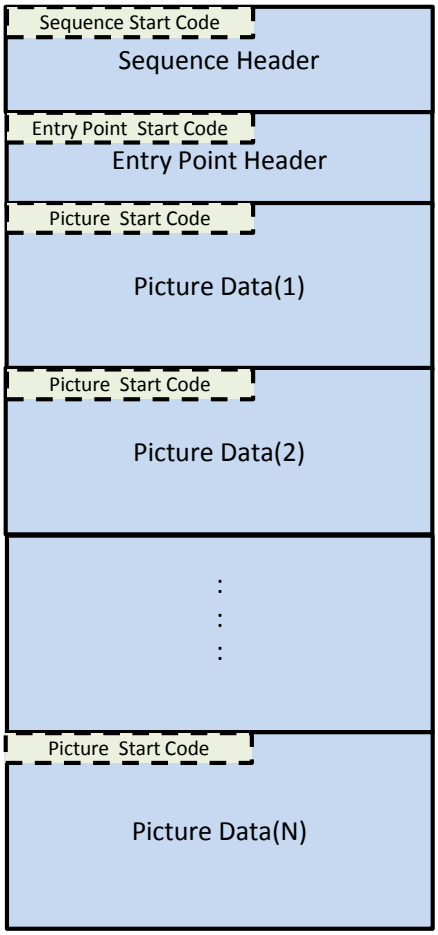

Figure 3-9 Input Stream Data Format for AP (Elementary Stream Format)

3.3. Output Picture Data Format

See related document [2].

4. API Reference

See related document [2].

5. Indexes

5.1. Standard Indexes of VC-1 Video Decoder Media Component

Table 5-1 lists the OpenMAX IL standard indexes that are available for VC-1 Video Decoder Media Component.

Table 5-1 Available Standard Indexes for VC-1 Video Decoder Media Component

Index	Description
OMX_IndexParamPortDefinition	See related document [2]
OMX_IndexParamVideoPortFormat	
OMX_IndexConfigCommonOutputCrop	
OMX_IndexConfigCommonScale	
OMX_IndexParamVideoProfileLevelQuerySupported	
OMX_IndexParamVideoProfileLevelCurrent	
OMX_IndexParamVideoVC1	See section 5.1.1

5.1.1. OMX_IndexParamVideoVC1

[Description] An index to access VC-1 Video codec related parameters.

[Corresponding Structure] OMX_VIDEO_PARAM_VC1TYPE structure

[Notes] None

5.2. Extended Indexes of VC-1 Video Decoder Media Component

Table 5-2 lists the OMX extended indexes that are available for VC-1 Video Decoder Media Component.

Table 5-2 Available extended indexes for VC-1 Video Decoder Media Component

Index	Description
OMXR_MC_IndexParamVideoReorder	See related document [2]
OMXR_MC_IndexParamVideoDeinterlaceMode	

5.3. Valid Indexes for OpenMAX IL Macro Functions

Table 5-3 shows which index is available for each port and which OpenMAX IL Macro function can be called to access the index.

Table 5-3 Valid Indexes and OpenMAX IL Macro Function

PortIndex	Index	Get/SetParameter		Get/SetConfig	
		Get	Set	Get	Set
VPB+0	OMX_IndexParamPortDefinition	See related document [2]			
	OMX_IndexParamVideoPortFormat				
	OMX_IndexParamVideoProfileLevelQuerySupported				
	OMX_IndexParamVideoProfileLevelCurrent				
	OMX_IndexParamVideoVC1	X	X	-	-
VPB+1	OMX_IndexParamPortDefinition	See related document [2]			
	OMX_IndexParamVideoPortFormat				
	OMX_IndexConfigCommonOutputCrop				
	OMX_IndexConfigCommonScale				
	OMXR_MC_IndexParamVideoReorder				
	OMXR_MC_IndexParamVideoDeinterlaceMode				

X : Valid
- : Invalid

6. Structures

Table 6-1 lists VC-1 Video Decoder Media Component specific structures.

Table 6-1 VC-1 Video Decoder Media Component Specific Structures

Structure Name	Description
OMX_VIDEO_PARAM_VC1TYPE	See section 6.1

Table 6-2 shows the notation for the access attribute of a structure member described in this section.

Table 6-2 Notation for the access attribute of a structure member

Member Name	Get	Set
Indicates the member name	Indicates the access attribute of the member in the OMX_GetParameter() or OMX_GetConfig(). “R” means IL client can get a value from the member. “W” means IL client must specify a value for the member.	Indicates the access attribute of the member in the OMX_SetParameter() or OMX_SetConfig(). “W” means IL client must/can specify a value for the member. “-“ means a specified value is ignored and not reflected.

6.1. OMX_VIDEO_PARAM_VC1TYPE

[Description] The structure to access VC-1 Video codec related parameters.

[Definition]
```
typedef struct tagOMX_VIDEO_PARAM_VC1TYPE {
    OMX_U32                     nSize;
    OMX_VERSIONTYPE             nVersion;
    OMX_U32                     nPortIndex;
    OMX_VIDEO_VC1PROFILETYPE    eProfile;
    OMX_VIDEO_VC1LEVELTYPE      eLevel;
} OMX_VIDEO_PARAM_VC1TYPE;
```

[Index] OMX_IndexParamVideoVC1

[Member]

Member Name	Get	Set
nSize	W	W
nVersion	W	W
nPortIndex	W	W
eProfile	R	-
eLevel	R	-

[Details]

nSize

Write Value	The size of the structure in bytes.
Read Value	-
Initial Value	-
Notes	-

nVersion

Write Value	The version number of OpenMAX IL specifications 1.1.2
Read Value	-
Initial Value	-
Notes	-

nPortIndex

Write Value	VPB + 0
Read Value	-
Initial Value	-
Notes	-

eProfile

Write Value	-
Read Value	OMX_VIDEO_VC1ProfileSimple OMX_VIDEO_VC1ProfileMain OMX_VIDEO_VC1ProfileAdvanced OMX_VIDEO_VC1ProfileNone
Initial Value	OMX_VIDEO_VC1ProfileSimple
Notes	This member is the profile of the video stream that is currently being processed.

eLevel

Write Value	-
Read Value	OMX_VIDEO_VC1LevelLow OMX_VIDEO_VC1LevelMedium OMX_VIDEO_VC1LevelHigh OMX_VIDEO_VC1Level0 OMX_VIDEO_VC1Level1 OMX_VIDEO_VC1Level2 OMX_VIDEO_VC1Level3 OMX_VIDEO_VC1Level4 OMX_VIDEO_VC1LevelNone
Initial Value	OMX_VIDEO_VC1LevelLow
Notes	This member is the level of the video stream that is currently being processed.

6.2. Specific Usage on Common Structure Members

This section describes VC-1 Video Decoder Media Component specific usage of the structures that are described in related document [2].

6.2.1. OMX_VIDEO_PORTDEFINITIONTYPE (Input Port)

[Index] OMX_IndexParamPortDefinition

[Details]

nFrameWidth

Write Value	80 - 1920
Read Value	(Current setting)
Initial Value	176
Notes	− An odd value is rounded down to the closest even value. − No effects on the decode processing.

nFrameHeight

Write Value	80 - 1920
Read Value	(Current setting)
Initial Value	144
Notes	− An odd value is rounded down to the closest even value. − No effects on the decode processing.

eCompressionFormat

Write Value	-
Read Value	OMX_VIDEO_CodingVC1
Initial Value	OMX_VIDEO_CodingVC1
Notes	-

6.2.2. OMX_VIDEO_PARAM_PORTFORMATTYPE (Input Port)

[Index] OMX_IndexParamVideoPortFormat

[Details]

eCompressionFormat

Write Value	-
Read Value	OMX_VIDEO_CodingVC1
Initial Value	OMX_VIDEO_CodingVC1
Notes	-

6.2.3. OMX_VIDEO_PARAM_PROFILELEVELTYPE (ProfileLevelQuerySupport)

[Index] OMX_IndexParamVideoProfileLevelQuerySupported

[Details]

eProfile

Write Value	-
Read Value	OMX_VIDEO_VC1ProfileSimple (nProfileIndex=0) OMX_VIDEO_VC1ProfileMain (nProfileIndex=1) OMX_VIDEO_VC1ProfileAdvanced (nProfileIndex=2)
Initial Value	OMX_VIDEO_VC1ProfileSimple
Notes	-

eLevel

Write Value	-
Read Value	OMX_VIDEO_VC1LevelMedium (nProfileIndex=0) OMX_VIDEO_VC1LevelHigh (nProfileIndex=1) OMX_VIDEO_VC1Level3 (nProfileIndex=2)
Initial Value	OMX_VIDEO_VC1LevelMedium
Notes	-

nProfileIndex

Write Value	0, 1, 2
Read Value	-
Initial Value	-
Notes	-

6.2.4. OMX_VIDEO_PARAM_PROFILELEVELTYPE (ProfileLevelCurrent)

[Index] OMX_IndexParamVideoProfileLevelCurrent

[Details]

eProfile

Write Value	-
Read Value	OMX_VIDEO_VC1ProfileSimple OMX_VIDEO_VC1ProfileMain OMX_VIDEO_VC1ProfileAdvanced OMX_VIDEO_VC1LevelNone
Initial Value	OMX_VIDEO_VC1ProfileSimple
Notes	-

eLevel

Write Value	-
Read Value	OMX_VIDEO_VC1LevelLow OMX_VIDEO_VC1LevelMedium OMX_VIDEO_VC1LevelHigh OMX_VIDEO_VC1Level0 OMX_VIDEO_VC1Level1 OMX_VIDEO_VC1Level2 OMX_VIDEO_VC1Level3 OMX_VIDEO_VC1Level4 OMX_VIDEO_VC1LevelNone
Initial Value	OMX_VIDEO_VC1LevelLow
Notes	-

nProfileIndex

Write Value	-
Read Value	0
Initial Value	0
Notes	-

6.2.5. OMXR_MC_VIDEO_DECODERESULTTYPE

[Index] N/A

[Details]

u32PictWidth

Write Value	-
Read Value	The width of the decoded picture data in pixels
Initial Value	-
Notes	If there is frame size change in the bitstream (Dynamic resolution change of VC-1), the value is pre-scaled frame size.

u32PictHeight

Write Value	-
Read Value	The height of the decoded picture data in pixels
Initial Value	-
Notes	If there is frame size change in the bitstream (Dynamic resolution change of VC-1), the value is pre-scaled frame size.

6.2.6. Buffer Flags (*nFlags*)

VC-1 Video Decoder Media Component has specific usage for the buffer flags listed in Table 6-3. For the other flags, see related document [2].

Table 6-3 Specific Usage on Buffer Flags

Flag	Description
OMX_BUFFERFLAG_CODECCONFIG	See section 3.1.1.

7. Memory Requirement

Table 7-1 describes the types of the memory that VC-1 Video Decoder Media Component requires.

Table 7-1 Required Memory Types

Memory Type	Accessible from	Description
input buffer	Hardware and CPU	Buffers for the input port. The required memory size is 1,572,864 x *nBufferCountActual*. For details of the *nBufferCountActual* member, see related document [2].
output buffer	Hardware and CPU	Buffers for the output port. The required memory size is (*nStride* x *nSliceHeight* x 3 / 2) x *nBufferCountActual.* For details of the *nBufferCountActual* member, see related document [2]. In the case IL client uses OMX_UseBuffer() for the output port, the allocated buffers must be accessible from hardware and need not be accessible from CPU.
work buffer	Hardware and CPU	Work buffers for decoding.
stream_work_0	Hardware	Work buffers for decoding.
stream_work_1	Hardware and CPU	
stream_work_2	Hardware	Work buffers for decoding. stream_work_2 is mv information work area.
stream_work_3	CPU	Work buffers for decoding.
stream_work_4	Hardware and CPU	
stream_work_5	Hardware and CPU	
frame_mem	Hardware	Frame buffers used for reference decoding and output.
lib_work_mem	CPU	A work buffer for storing information used for decoding control.
tmp_work_mem	CPU	A temporary work buffer required for the initial stream header decoding.

Note: For hardware restrictions of memory, see related document [4].

Table 7-2 shows the memory requirement in the case of 1920x1080 Advanced Profile stream decoding per component instance. Multiple component instances require their own work memory, respectively.

Table 7-2 Memory Requirement for 1920x1080 Advanced Profile Stream Decoding

Memory Type	Size	Notes
input buffer	3 [Mbyte]	In the case where the *nBufferCountActual* for the input port is set to 2.
output buffer	9 [Mbyte]	In the case where the *nBufferCountActual* for the output port is set to 3.
work buffer	3 [Mbyte]	-
stream_work_0	20 [Mbyte]	-
stream_work_1	139 [Kbyte]	Fixed size
stream_work_2	1,599 [Kbyte]	-
stream_work_3	18 [Kbyte]	Fixed size
stream_work_4	4 [Kbyte]	-
stream_work_5	1 [Kbyte]	Fixed size
frame_mem	30 [Mbyte]	-
lib_work_mem	128 [Kbyte]	Fixed size
tmp_work_mem	840 [Kbyte]	Fixed size

REVISION HISTORY	OMX Media Component User's Manual : VC-1 Video Decoder Part

Rev.	Date	Description	
		Page	Summary
0.04	Jan. 31, 2013	–	Draft revision based on Japanese User's Manual Rev.0.04.
0.05	Mar. 25, 2014	31	Add the detailed information of Memory Requirement.
0.06	May. 29, 2014	4,16	Fixed Figure1-1: "Video Common Library" to "Video Decoder Common Library" Fixed Figure 3-8: add "Sequence Layer Data Structure"
	May. 30, 2014	31	Correct the descriptions for stream_work_x and lib_work_mem in Table 7-1
	June. 4, 2014	31	Correct the value for stream_work_2 size in Table 7-2
	Jul. 4, 2014	31	Updated Description of stream_work_* in Table7-1 Updated Notes and Size in Table7-2
0.07	Jul. 29, 2014	31	Highlight reference to the related document of Table 7-1..
1.00	Aug. 20 2014	30	Add section 6.3.5.OMXR_MC_VIDEO_DECODERESULTTYPE.
	Aug. 20 2014	31	Fixed Table 7-1
	Aug. 26, 2014	6	Delete VCP, FDP and Converter of term.
1.0.1	Oct.14 2014	32-33	Added the "work buffer" in Table7-1/Table7-2.

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