User's Manual

OMX Media Component

User's Manual Audio Common Part

Renesas Electronics
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1. Overview

1.1. Overview of This Document

This document is the User's Manual for the OMX Media Component and common specifications of the OMX Audio Media Component are described.

Please read this document with related document [1] “OMX Media Component User's Manual Common Part”.

1.2. Overview of Audio Common Part and Scope of This Document

The OMX Audio Media Component consists of the OMX Media Component Common Library which provides common functions of OpenMAX IL, the OMX Media Component Audio Common Library which provides common functions of audio codec, and the OMX Media Component Codec Dependent Library which realizes functions of individual codec. The OMX Media Component Codec Dependent Library is defined for each codec.

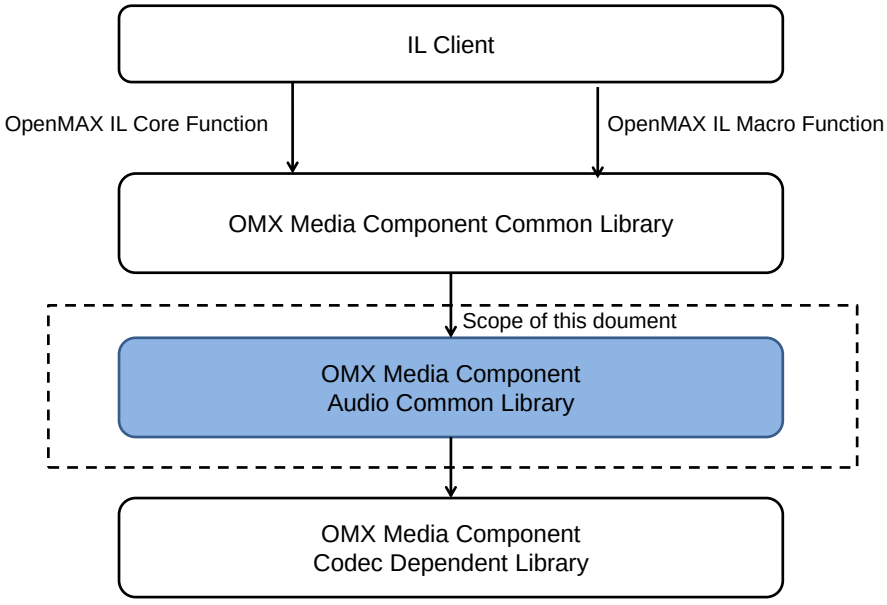

Figure 1-1 Software Configuration of OMX Audio Media Component and Scope

In this document, audio common specifications are described. For common specifications of Media Component, please refer to related document [1]. For codec dependent specifications, please refer to User's Manual of related Media Component.

In this document, collective term “Audio Media Component” is used for Media Component of each audio codec.

1.3. Related Document

Table 1-1 shows the reference documents and related documents.

Table 1-1 List of Related Documents

No	Document Name	Description
[1]	OMX Media Component User's Manual Common Part	Specification documents of OMX Common Part.
[2]	OpenMAX Integration Layer Application Programming Interface Specification Version 1.1.2, September 1, 2008	Specification documents of OpenMAX IL.

1.4. Terminology

Table 1-2 shows the terminology used in this document.

Table 1-2 Terminology

Term	Abbreviation	Description
Audio Port Base	APB	The base value of the port index of the Audio Media Component. The port index values of the input and output ports are obtained by adding offset values to this base value.
OpenMAX IL	-	Open API specified by the Khronos Group. It standardizes accesses to primitive media processing which is commonly used in graphics, audio, and image libraries.
Component	-	Refers to a component that is defined in OpenMAX IL Specification.
Media Component	MC	A component that performs multimedia processing. It corresponds to the Component that is defined in OpenMAX IL.
IL Client	-	Refers to software that uses functions of OpenMAX IL Core and Component.

2. Functions

The Audio Media Component is the component that provided functions to encode/decode data of various audio standards. The Audio Media Component performs encode/decode processing when data is stored in the input buffer and stores resulted data to the output buffer.

2.1. Function Details

2.1.1. Output Mode Change Function

The Audio Media Component supports 2 modes, one is output in decode/encode unit and the other is output in output buffer unit. However, for support of this function and output unit, please refer to the User's Manual of each codec Media Component.

2.1.2. Masking Function of Port Information Change

The Audio Media Component generates the OMX_EventPortSettingsChanged event when port information is changed. If notification of port information change is not need, it is possible to suppress event generation by masking event. For information that change is notified and masking value, please refer to the User's Manual of each codec Media Component. Table 2-1 shows common maskable information in the Audio Media Component.

Table 2-1 List of Maskable Information

Information	Masking Value
nSamplingRate	OMXR_MC_AUDIO_EVENTMASK_SAMPLINGRATE
nChannels	OMXR_MC_AUDIO_EVENTMASK_CHANNELS
eChannelMapping	OMXR_MC_AUDIO_EVENTMASK_CHANNELMAPPING

2.1.3. Error Notification Function

The Audio Media Component generates error event (OMX_ErrorStreamCorrupt) if they determine that input stream can not be decoded (non-standard streams etc.). If this error event is notified, it is impossible to do next decode until you transit state to OMX_StateIdle once.

2.2. Port

The Audio Media Component has one input port and one output port basically. For actual number of ports in each codec Media Component, please refer to the User's Manual of each codec Media Component.

Table 2-2 Basic Ports of Audio Media Components

Component	Port Index	Type
Audio Media Component	APB+0	Input Port
	APB+1	Output Port

Since available indexes for each I/O port are decided, please refer to section 5.3 for them.

2.3. Data Flow

Figure 2-1 shows the data flow of the Audio Media Component. The Audio Media Component performs encode/decode processing when input data is stored in the input port and stores output data to the output port.

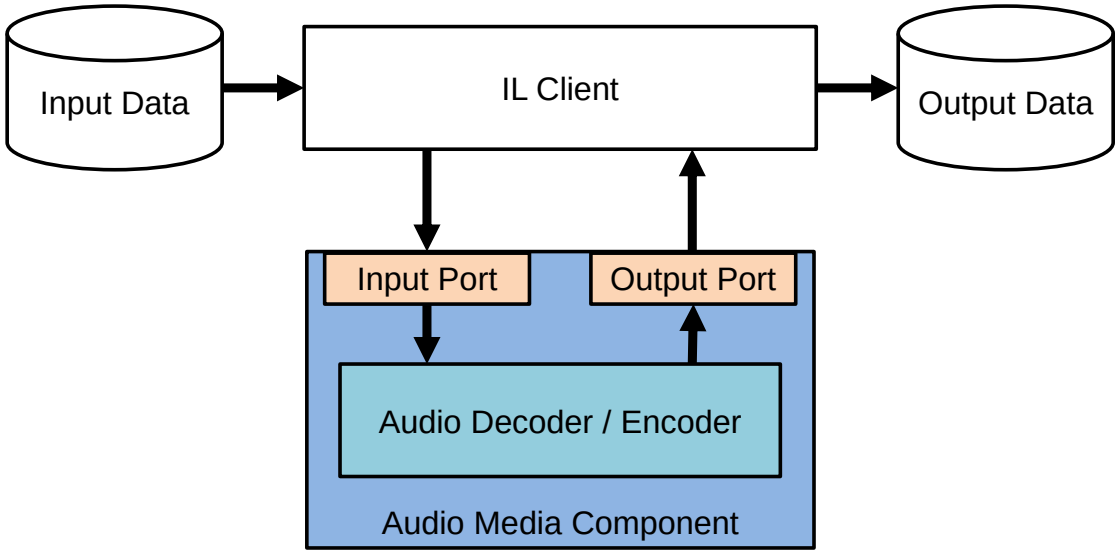

Figure 2-1 Data Flow of Audio Media Component

3. I/O Data Format

3.1. Buffer Payload

Since the data storage format to I/O buffer depends on each codec Media Component, please refer to the User's Manual of each codec Media Component.

3.2. Input Data Format

Since the data format of input stream depends on each codec standard, please refer to the User's Manual of each codec Media Component.

3.3. Output Data Format

Since the data format of output stream depends on each codec standard, please refer to the User's Manual of each codec Media Component.

3.4. PCM Data Format

The data storage method of PCM data depends on the width of bits. Figure 3-1 shows bits configuration of PCM data. If the width of valid bits is 24 bits per sample, areas of 32 bits are used, PCM data is stored at the LSB 24 bits and the MSB 8 bits are sign-extended.

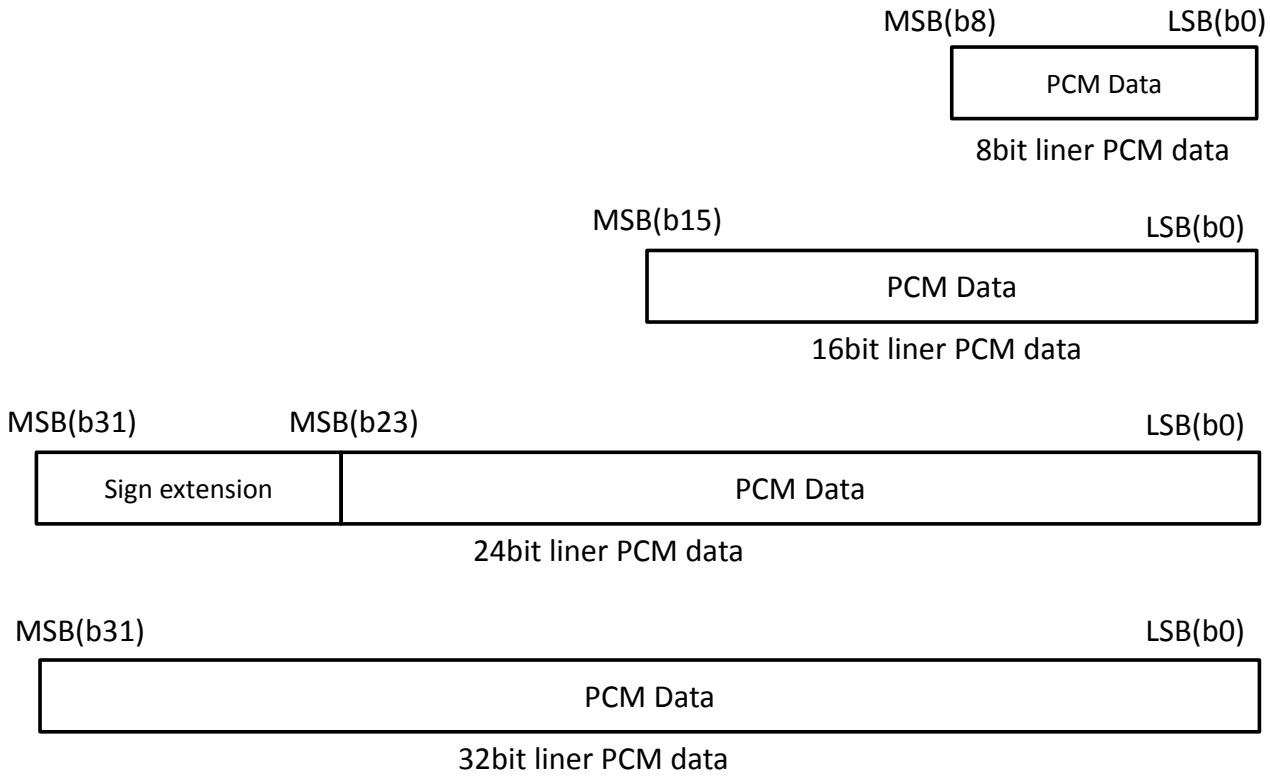

Figure 3-1 Bits Configuration of PCM Data

Figure 3-2 shows the buffer storage format of PCM data in the Audio Media Component. The data from 2 to 5.1 channels is stored to the buffer as interleaved format.

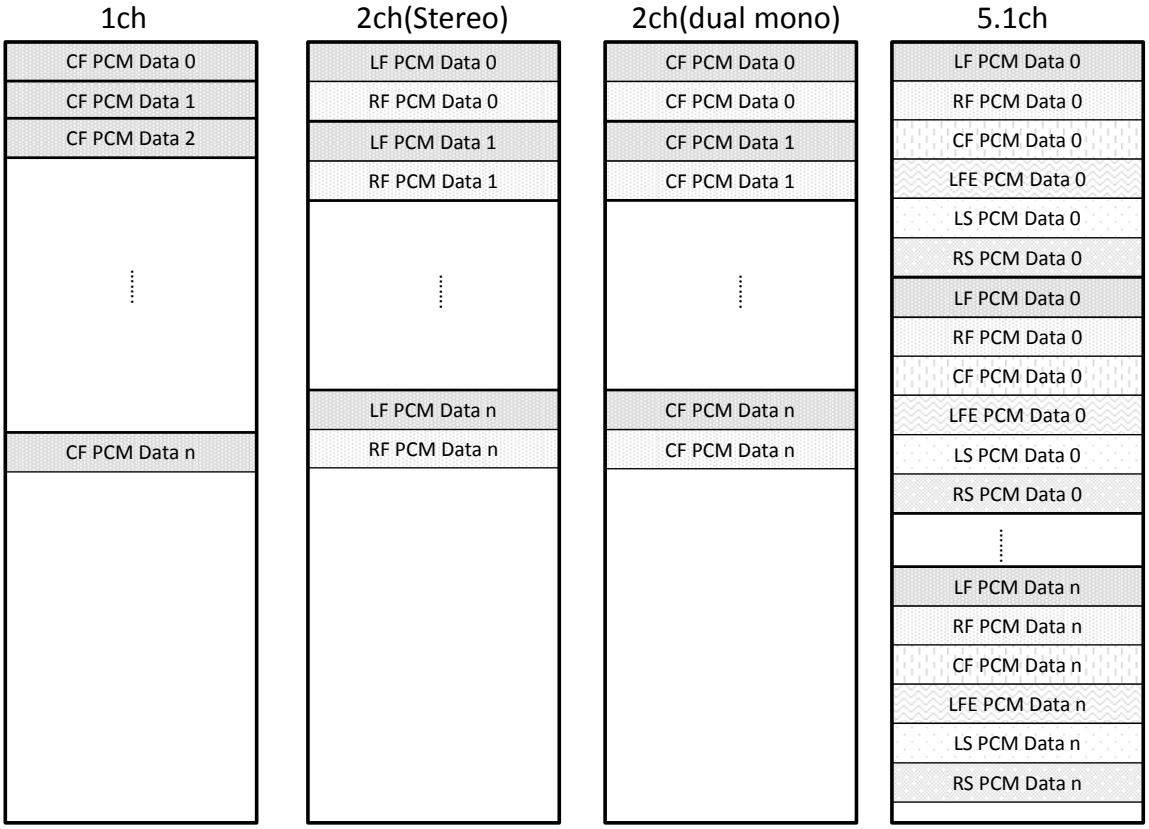

Figure 3-2 Buffer Storage Format of PCM Data

4. API Reference

Please refer to the related document [1] for OpenMAX IL Core functions and Macro functions. In this section, only different information with the related document [1] is shown.

4.1. OpenMAX IL Macro functions

4.1.1. OMX_UseBuffer

[Reference] The related document [1]

[Note]
- The buffer size (nSizeBytes) must be set to the value that is stored in nBufferSize of the OMX_PARAM_PORTDEFINITIONTYPE structure which is obtained by calling the OMX_GetParameter() function specifying the OMX_IndexParamPortDefinition index.
- Please set the accessible address allocated by user to pBuffer. And, please allocate memory with 4 bytes align.

[Remarks] None

4.2. Callback Functions

4.2.1. (*EventHandler)( )

The Audio Media Component generates the OMX_EventPortSettingsChanged event when the output data is different with information set to the port. If the OMX_EventPortSettingsChanged event is generated, please get the correct information on output data by the OMX_GetParameter() or OMX_GetConfig() function. For conditions that the OMX_EventPortSettingsChanged event is generated, please refer to the User's Manual of each codec Media Component.

5. Indexes

Indexes available for the Audio Media Component are shown.
For indexes available for each codec Media Component uniquely, please refer to the User's Manual of each codec Media Component.

5.1. Standard Indexes for Audio Media Component

Table 5-1 shows the list of standard indexes that are available for the Audio Media Component.

Table 5-1 List of Indexes available for Audio Media Component

Index	Corresponding Strucure Name
Description	
OMX_IndexParamPortDefinition	OMX_AUDIO_PORTDEFINITIONTYPE Structure
To get settings of I/O port.	
OMX_IndexParamAudioPortFormat	OMX_AUDIO_PARAM_PORTFORMATTYPE Structure
To get formats of I/O data.	

5.2. Expanded Indexes of Audio Media Component

Table 5-2 shows the list of expanded indexes that are available for the Audio Media Component.

Table 5-2 List of Expanded Indexes available for Audio Media Component

Index (Expanded Index Name)	Corresponding Strucure Name
Description	
OMXR_MC_IndexParamAudioOutputUnit (OMX.RENESAS.INDEX.PARAM.AUDIO.OUTPUTUNIT)	OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE Structure
To set or get output unit.	
OMXR_MC_IndexParamAudioPortSettingMask (OMX.RENESAS.INDEX.PARAM.AUDIO.PORTSETTINGSEVENTMASK)	OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE Structure
To set or get mask of event generation when port information is changed.	

5.3. Indexes Specified by OpenMAX IL Macro functions

Table 5-3 shows indexes which can be specified by OpenMAX IL Macro functions and available port index for the Audio Media Component.

Table 5-3 Lists of Indexes Specified by OpenMAX IL Macro Functions and Available Ports

Index	Get/SetParameter		Get/SetConfig		Port Index	
	Get	Set	Get	Set	APB+0	APB+1
OMX_IndexParamPortDefinition	x	x	-	-	x	x
OMX_IndexParamAudioPortFormat	x	x	-	-	x	x
OMXR_MC_IndexParamAudioOutputUnit	x	x	-	-	-	x
OMXR_MC_IndexParamAudioPortSettingsEventMask	x	x	-	-	-	x

x : Effective
- : Ineffective

6. Structures

For the structures that are common to all the OMX Media Components, see related documents [1].

Table 6-1 shows the list of structures for Audio Media Component described in this document.

Table 6-1 List of Structures for Audio Media Component

Structure Name	Decscription	Ref
OMX_AUDIO_PORTDEFINITIONTYPE	Audio Port Definition Information Structure	Section 6.1
OMX_AUDIO_PARAM_PORTFORMATTYPE	Audio Port Format Information Structure	Section 6.2
OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE	Output Data Storage Unit Structure	Section 6.3
OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE	Event Mask Setting Structure for Port Information Change	Section 6.4

Given blow is an explanation of how to interpret the member of the structures described in this section.

- ✓ Description of a member of a structure corresponded to index

[Member]

Member Name	Get	Set
Indicates the member name	Indicates the attribute of the member specified in the OMX_GetParameter () or OMX_GetConfig () function. If "R" is written, the value of this member can be obtained. If "W" is written, please specify a value in this member.	Indicates the attributes of the member specified in the OMX_SetParameter () or OMX_SetConfig () function. If "W" is written, please specify a value in this member. If “-” is written, the value of this member is ignored. Any value specified in this member is not reflected.

6.1. OMX_AUDIO_PORTDEFINITIONTYPE

[Structure] Please refer to section 4.1.5 in the related document [2].

[Function] Please refer to section 4.1.5 in the related document [2].

[Members]

Member Name	Get	Set
cMIMEType	R	-
pNativeRender	R	-
bFlagErrorConcealment	R	-
eEncoding	R	-

[Details]

cMIMEType

Configurable value	-
Acquirable value	NULL
Initial value	NULL
Remarks	Not supported.

pNativeRender

Configurable value	-
Acquirable value	NULL
Initial value	NULL
Remarks	Not supported.

bFlagErrorConcealment

Configurable value	-
Acquirable value	OMX_FLASE
Initial value	OMX_FLASE
Remarks	Not supported.

eEncoding
Please refer to the User's Manual of each codec Media Component.

6.2. OMX_AUDIO_PARAM_PORTFORMATTYPE

[Structure] Please refer to section 4.1.6 in the related document [2].

[Function] Please refer to section 4.1.6 in the related document [2].

[Members]

Member Name	Get	Set
nSize	W	W
nVersion	R	-
nPortIndex	W	W
nIndex	W	-
eEncoding	R	-

[Details]

nSize

Configurable value	Specify the size (in bytes) of the OMX_AUDIO_PARAM_PORTFORMATTYPE structure.
Acquirable value	-
Initial value	-
Remarks	-

nVersion

Configurable value	-
Acquirable value	Specification version of OpenMAX IL (1.1.2).
Initial value	Specification version of OpenMAX IL (1.1.2).
Remarks	-

nPortIndex

Configurable value	Port index of each codec Media Component.
Acquirable value	-
Initial value	-
Remarks	For configurable value, Please refer to the User's Manual of each codec Media Component.

nIndex

Configurable value	Index of media format.
Acquirable value	-
Initial value	-
Remarks	Specifies the number to get format information (a component supports one or more formats). If the corresponding format information is not found, OMX_GetParameter( ) return OMX_ErrorNoMore.

eEncoding
Please refer to the User's Manual of each codec Media Component.

6.3. OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE

[Structure]
```
typedef struct OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE {
    OMX_U32                     nSize;
    OMX_VERSIONTYPE             nVersion;
    OMX_U32                     nPortIndex;
    OMXR_MC_AUIDO_UNITTYPE      eUnit;
} OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE;
```

[Function] Output unit structure

[Members]

Member Name	Get	Set
nSize	W	W
nVersion	R	-
nPortIndex	W	W
eUnit	R	W

[Details]

nSize

Configurable value	Specify the size (in bytes) of the OMXR_MC_AUDIO_PARAM_OUTPUTUNITTYPE structure.
Acquirable value	-
Initial value	-
Remarks	-

nVersion

Configurable value	-
Acquirable value	Specification version of OpenMAX IL (1.1.2).
Initial value	Specification version of OpenMAX IL (1.1.2).
Remarks	-

nPortIndex

Configurable value	Port index of each codec Media Component.
Acquirable value	-
Initial value	-
Remarks	For configurable value, Please refer to the User's Manual of each codec Media Component.

eUnit

Configurable value	OMXR_MC_AUDIO_UnitFrame OMXR_MC_AUDIO_UnitFull
Acquirable value	Setting value.
Initial value	OMXR_MC_AUDIO_UnitFrame
Remarks	Specifies the output unit.

Value	Description
OMXR_MC_AUDIO_UnitFrame	Data is stored in frame unit.
OMXR_MC_AUDIO_UnitFull	Data is stored in buffer unit.

6.4. OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE

[Structure]
```
typedef struct OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE {
    OMX_U32         nSize;
    OMX_VERSIONTYPE nVersion;
    OMX_U32         nPortIndex;
    OMX_U32         nMaskedBits;
} OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE;
```

[Function] Structure to mask setting change event

[Members]

Member Name	Get	Set
nSize	W	W
nVersion	R	-
nPortIndex	W	W
nMaskedBits	R	W

[Details]

nSize

Configurable value	Specify the size (in bytes) of the OMXR_MC_AUDIO_PARAM_PORTSETTINGSEVENTMASKTYPE structure.
Acquirable value	-
Initial value	-
Remarks	-

nVersion

Configurable value	-
Acquirable value	Specification version of OpenMAX IL (1.1.2).
Initial value	Specification version of OpenMAX IL (1.1.2).
Remarks	-

nPortIndex

Configurable value	Port index of each codec Media Component.
Acquirable value	-
Initial value	-
Remarks	For configurable value, please refer to the User's Manual of each codec Media Component.

nMaskedBits

Configurable value	OMXR_MC_AUDIO_EVENTMASK_SAMPLINGRATE OMXR_MC_AUDIO_EVENTMASK_CHANNELS OMXR_MC_AUDIO_EVENTMASK_CHANNELMAPPING
Acquirable value	Setting value.
Initial value	0(no mask).
Remarks	Multiple masks can be specified to this member with logical OR. And, for the masked bits expanded by each component, please refer to the User's Manual of each codec Media Component.

Value	Description
OMXR_MC_AUDIO_EVENTMASK_SAMPLINGRATE	To mask the event generation when the value of sampling frequency is changed.
OMXR_MC_AUDIO_EVENTMASK_CHANNELS	To mask the event generation when the number of channel is changed.
OMXR_MC_AUDIO_EVENTMASK_CHANNELMAPPING	To mask the event generation when the mapping of channel is changed.

6.5. Structure Members Used in a Unique Manner

Table 6-2 shows structure members used in a unique manner for the Audio Media Component.

Table 6-2 Structure Members Used in a Unique Manner

Structure Name	Member	Usage
OMX_BUFFERHEADERTYPE (refer to section 5.1.1 in the related document [1])	pBuffer	IL Client cannot change pBuffer of the Audio Media Component,
	nTickCount	Any value can be specified. The value specified in this member is copied into a member of the OMX_BUFFERHEADERTYPE structure which is returned by the (*FillBufferDone)( ) callback function.
	nTimeStamp	Any value can be specified. The value specified in this member is copied into a member of the OMX_BUFFERHEADERTYPE structure which is returned by the (*FillBufferDone)( ) callback function.
	nFlags	Please refer to 6.5.2.

6.5.1. TickCount and TimeStamp (nTickCount,nTimeStamp)

TickCount and TimeStamp (nTickCount, nTimeStamp in the OMX_BUFFERHEADERTYPE structure) for the Audio Media Component is shown as below.

If the data of an input buffer is output to one output buffer, the values of nTickCount and nTimeStamp at input buffer are copied to nTickCount and nTimeStamp at output buffer.

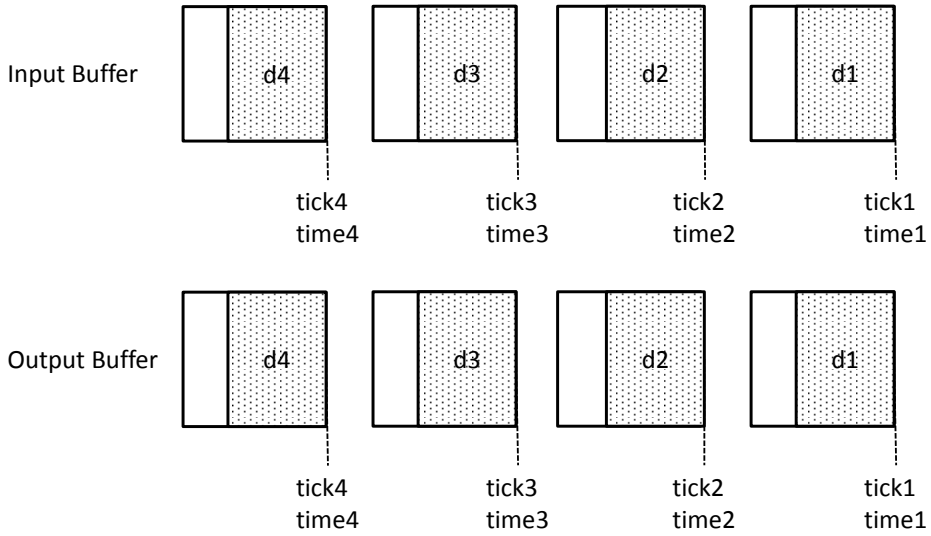

Figure 6-1 The data of an input buffer is stored to one output buffer

If the data of an input buffer is output to multiple output buffers, the value of nTickCount at input buffer corresponding to the leading data of output buffer is copied to nTickCount at output buffer. And sum (ex: time 2 + T1 in Figure 6-2) of the value of nTimeStamp at input buffer and time (ex: T1 in Figure 6-2) calculated by sampling frequency and number of output samples is set to nTimeStamp at output buffer.

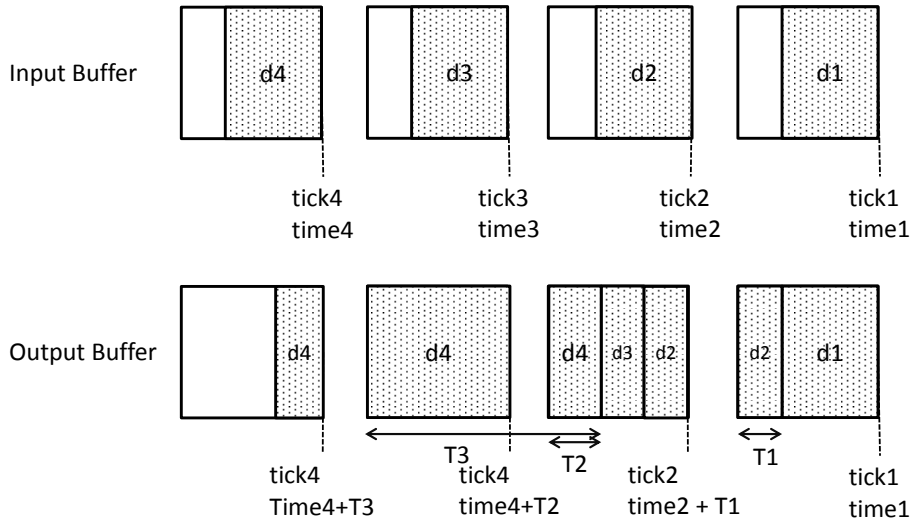

Figure 6-2 The data of an input buffer is stored to multiple output buffers

For codec dependent specifications of nTickCount and nTimeStamp, please refer to User's Manual of related Media Component.

6.5.2. Buffer Flag (nFlags)

The buffer flag (nFlags in the OMX_BUFFERHEADERTYPE structure) for the Audio Media Component is shown as below.

Each flag is a bit field. Therefore, if multiple flags are set for input buffer, please set the value combined with logical OR. If multiple factors are generated for output buffer, the value combined with logical OR is set.

Table 6-3 Buffer Flag for I/O Port

Flag Name (nFlags)	Description for support
OMX_BUFFERFLAG_EOS	Figure 6-3 and Figure 6-4 show the setting method of OMX_BUFFERFLAG_EOS. There are 2 cases where this flag is set for final data and set for empty buffer.
OMX_BUFFERFLAG_STARTTIME	These flags do not affect the processing of Media Component but the flag set to input buffer is transferred to related output buffer.
OMX_BUFFERFLAG_DECODEONLY	
OMX_BUFFERFLAG_DATACORRUPT	Please refer to the user's manual of each codec Media Component.
OMX_BUFFERFLAG_ENDOFFRAME	Figure 6-5 shows the setting method of OMX_BUFFERFLAG_ENDOFFRAME. Please set this flag when 1 frame data can be stored to multiple buffers. For input method, Please refer to the user's manual of each codec Media Component.
OMX_BUFFERFLAG_SYNCFRAME	These flags do not affect the processing of Media Component but the flag set to input buffer is transferred to related output buffer.
OMX_BUFFERFLAG_EXTRADATA	
OMX_BUFFERFLAG_CODECCONFIG	Please refer to the user's manual of each codec Media Component.

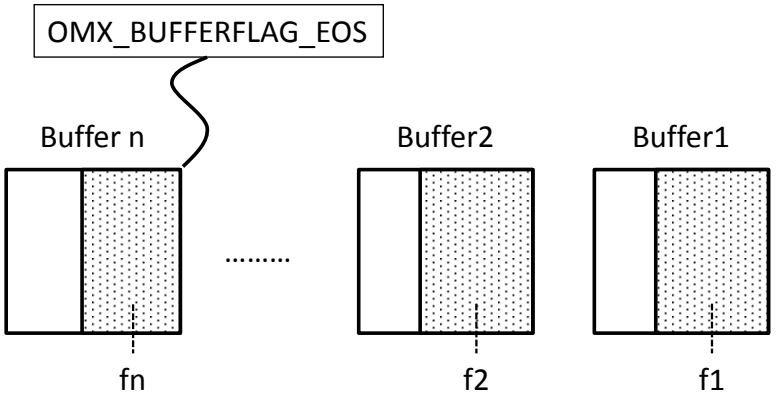

Figure 6-3 OMX_BUFFERFLAG_EOS is Set for Final Data

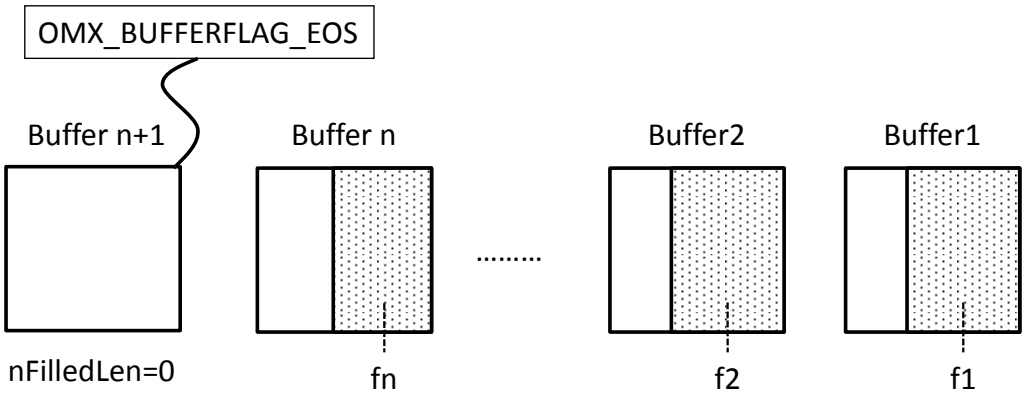

Figure 6-4 OMX_BUFFERFLAG_EOS is Set for Empty Buffer

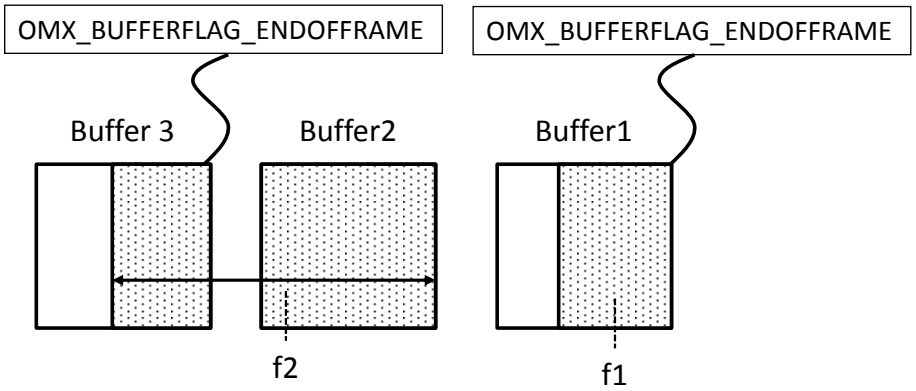

Figure 6-5 Setting of OMX_BUFFERFLAG_ENDOFFRAME

7. Error

7.1. Errors and Error Handling

Table 7-1 shows the description for the flow control and stream errors and how to handle the error.

Table 7-1 Errors and Error Handling

Error Code	Description
OMX_ErrorStreamCorrupt	[Reason] This error is reported via event callback when the Audio Media Component cannot handle the input stream. -The input stream is out of support. -The input stream contains unsupported profile or tools. [Error Handling] To resume the decode operation it requires the state transition to OMX_StateIdle state.
OMX_ErrorOverflow	[Reason] The Audio Decoder Media Component receives a buffer that is already received from the IL client via OMX_EmptyThisBuffer or OMX_FillThisBuffer. [Error Handling] Although it is possible to continue the decode operation, make sure that the buffer management and the API sequence are correct in the IL Client side.
OMX_ErrorUnderflow	[Reason] The Audio Media Component does not return this error code.

Revision History	OMX Media Component User's Manual Audio Common Part

Rev.	Date	Description	
		Page	Summary
0.01	Aug. 30, 2013	-	Newly created.
0.02	Sep. 20, 2013	-	Modified structure explanation in Section 6.
0.03	Nov. 26, 2013	19	Add explanation for nTickCount and nTimeStamp in Section 6.5.1
0.04	Feb. 20, 2013	18 22	Add explanation pBuffer. Add explanation for Error in Section 7.
0.05	Jun. 3, 2014	-	Correction of errors.
0.10	Jul. 18, 2014	-	Correction of errors.
1.00	Oct. 10, 2014	-	Official Release

OMX Media Component User's Manual
Audio Common Part

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