

MOST

Media Oriented Systems Transport

Multimedia and Control
Networking Technology

MOST Specification for Stream Transmission

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MOSTCO CONFIDENTIAL

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Document History

Version	Date	Section	Comment on changes
1.1-05	2004-02-10	-	First version
1.1-06	2004-04-01	-	Minor changes
1.2-00	2005-11-18	4	WD_DA task: Added appendix from MOST Specification 2.4 S/PDIF added in Table 4-1 Mapping Tables 4-5 and 4-6 for DTS and MPEG-2 added
1.3-00	2006-03-12	All	Extended section with HD audio formats. Change ChannelList description according to WG-DA / remove HD audio formats.
1.3-00	2007-03-12	1.1	Added remark that the specification only applies to speed grade MOST25.
1.3-01	2007-10-15	All	Corrected clerical errors, minor changes.
		3 5.4.1.1 5.4.2.1	Added distinction between speed grades MOST25 and MOST50.
		5.4.3	Added values 0x11...0x14 to AudioChannelName table.
		5.4.3.1	Added distinction between speed grades MOST25 and MOST50.
		5.4.3.2	Added mapping tables for Dolby Digital Plus and DTS HD.
		5.5.1 5.5.2 5.5.3	Added distinction between speed grades MOST25 and MOST50.
		7.2.1	Added remark on relevance of MediaType. 0x00 is now the default value.
		7.2.2	Added Blockwidth 65 and 97 for MOST 50.
1.3-02	2007-12-04	All	Review changes of the WG Streaming - Re-change wording: channel - Correct AudioChannelNames Minor changes

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1 Introduction and Overview

1.1 Purpose

This document describes the stream format for the transmission of audiovisual data over the MOST network.

1.2 Related Documents

Document	Revision
CDDA: Compact Disc Digital Audio System Description (Red Book)	May 1999
VideoCD: Video CD Specification (White Book), Version 2.0	April 1995
Super VideoCD: Super VideoCD Specifications, Version 1.0	May 1999
DVD-Video: DVD Specifications for Read-Only Disc, Part 3, Video Specifications, Version 1.1	September 1999
DVD-Audio: DVD Specifications for Read-Only Disc, Part 4, Audio Specifications, Version 1.2	March 2001
MPEG ISO/IEC 11172-1 for MPEG1 System ISO/IEC 11172-2 for MPEG1 Video ISO/IEC 11172-3 for MPEG1 Audio ISO/IEC 13818-1 for MPEG2 Systems ISO/IEC 13818-2 for MPEG2 Video ISO/IEC 13818-3 for MPEG2 Audio	
5C Digital Transmission Content Protection Specification	
MOST Content Security Specification Rev. 1.0	
MOST Content Protection Scheme – DTCP Implementation Rev.2.2	

1.3 Abbreviations

Abbreviation	Description	Abbreviation	Description
AC3	Audio Coding 3, the compression scheme used by Dolby Digital	MPEG	Motion Picture Experts Group
CBR	Constant Bit Rate	SACD	Super AudioCD
CD	Compact Disc	SDDS	Sony Dynamic Digital Sound
DD	Dolby Digital	S/PDIF	Sony/Philips Digital Interface Format
DTS	Digital Theatre Sound	SVCD	Super VideoCD
DVD	Digital Versatile Disc	VBR	Variable Bit Rate
FS	Sample Rate	VCD	VideoCD
ISO	International Standardization Organization	MOST	Media Oriented Systems Transport
LPCM	Linear Pulse Code Modulation		

Table 1-1: Abbreviations

2 Introduction to MOST Stream Transmission

This document specifies the transmission of audiovisual data over the MOST network.

Two transmission classes are defined: SYNCHRONOUS and ISOCHRONOUS. While MOST supports synchronous transmission by nature, isochronous transmission is realized as a protocol extension based on a synchronous channel. A Stream Associated Data channel (SAD) is defined for this purpose.

Further, data streams can be distinguished by their structure. Discrete frame type streams as well as packetized data streams are considered by this specification.

A typical example of discrete frame type streams are PCM audio samples, for example, from an audio CD. The data's timing is characterized by a constant sample rate (e.g., 44.1 kHz).

Typical applications for packetized data are MPEG streams. Here, the data often has no further timing requirements other than that the data should arrive in time to fulfill the appropriate buffer model of the application.

Transmission of stereo and multi-channel signals as well as low sampling rates or small bandwidth special stream formats are defined.

Further, transmission of MPEG1 SystemStream, MPEG2 ProgramStreams, MPEG2 TransportStream, and MPEG4 is described. The MPEG4 data is encapsulated in the MPEG2 system layer. This enables the transmission of VideoCD or DVD streams, the distribution of digital television programs, or the streaming of Internet content over the MOST network.

A special focus is directed also to copy-protected data, which requires an encrypted transmission. In this context the application of the IEC958 Serial Copy Management (S/PCIF SCM) and the Digital Transmission Content Protection Scheme (DTCP) is described. In order to enable this content protection schemes for a synchronous data transmission, a Stream Associated Data channel (SAD) is defined.

3 Available Bit Rates on MOST

By allocating synchronous channels, bandwidth can be provided in multiples of the MOST network sample rate (FS).

$$\text{Bit rate/kbps} = \text{FS/kHz} * \text{BlockWidth/bytes} * 8$$

The following table lists 60 different constant bitrates (CBR) for the popular 44.1 kHz and 48.0 kHz sample rates. Apart from that, some examples of popular applications and the required bandwidth are given. The table below is for information only; it does not define requirements for actual implementations.

Streams with variable bit rates (VBR) or streams, which are not locked to the MOST FS (i.e., which are isochronous), are transferred by using a slightly higher MOST CBR than the maximum bit rate limit.

MOST Network @ 44.1 kHz		MOST Network @ 48 kHz	
Block Width		Block Width	
Bytes	KBps Mbps	Bytes	KBps Mbps
1	44.1 0.35	1	48.0 0.38
2	88.2 0.71	2	96.0 0.77
3	132.3 1.06	3	144.0 1.15
4	CD_Audio, VideoCD 176.4 1.41	4	CD_Audio, VideoCD 192.0 1.54
5	220.5 1.76	5	240.0 1.92
6	264.6 2.12	6	288.0 2.30
7	308.7 2.47	7	336.0 2.67
8	SuperVCD 352.8 2.82	8	SuperVCD 384.0 3.07
9	396.9 3.18	9	432.0 3.46
10	441.0 3.53	10	480.0 3.84
11	485.1 3.88	11	528.0 4.22
12	529.2 4.23	12	576.0 4.61
13	573.3 4.59	13	624.0 4.99
14	617.4 4.92	14	672.0 5.38
15	661.5 5.29	15	720.0 5.76
16	705.6 5.64	16	768.0 6.14
17	749.7 6.00	17	816.0 6.53
18	793.8 6.35	18	864.0 6.91
19	837.8 6.70	19	912.0 7.30
20	882.0 7.06	20	960.0 7.68
21	926.1 7.41	21	1008.0 8.06
22	970.2 7.76	22	1056.0 8.45
23	1014.3 8.11	23	1104.0 8.83
24	1058.4 8.47	24	1152.0 9.22
25	1102.5 8.82	25	1200.0 9.60
26	1146.6 9.17	26	1248.0 9.98
27	1190.7 9.53	27	DVD @ 10.08 Mbps 1296.0 10.37
28	1234.8 9.88	28	1344.0 10.75
29	DVD @ 10.08 Mbps 1278.9 10.23	29	1392.0 11.14
30	1323.0 10.58	30	1440.0 11.52

Table 3-1: Available Constant Bit Rates (1-30 Bytes BlockWidth)

The Table 3-1 above describes bit rates for both 44.1 kHz and 48 kHz networks.

MOST Network @ 44.1 kHz		MOST Network @ 48 kHz	
Block Width		Block Width	
Bytes	KBps Mbps	Bytes	KBps Mbps
31	1367.1 10.94	31	1488.0 11.90
32	1411.2 11.29	32	1536.0 12.29
33	1455.3 11.64	33	1584.0 12.67
34	1499.4 12.00	34	1632.0 13.06
35	1543.5 12.35	35	1680.0 13.44
36	1587.6 12.70	36	1728.0 13.82
37	1631.7 13.05	37	1776.0 14.21
38	1675.8 13.41	38	1824.0 14.59
39	1719.9 13.76	39	1872.0 14.98
40	1764.0 14.11	40	1920.0 15.36
41	1808.1 14.46	41	1968.0 15.74
42	1852.2 14.82	42	2016.0 16.13
43	1896.3 15.17	43	2064.0 16.51
44	1940.4 15.52	44	2112.0 16.90
45	1984.5 15.88	45	2160.0 17.28
46	2028.6 16.23	46	2208.0 17.66
47	2072.7 16.58	47	2256.0 18.05
48	2116.8 16.93	48	2304.0 18.43
49	2160.9 17.29	49	2352.0 18.82
50	2205.0 17.64	50	2400.0 19.20
51	2249.1 17.99	51	2448.0 19.58
52	2293.2 18.35	52	2496.0 19.97
53	2337.3 18.70	53	2544.0 20.35
54	2381.4 19.05	54	2592.0 20.74
55	2425.5 19.40	55	2640.0 21.12
56	2469.6 19.76	56	2688.0 21.50
57	2513.7 20.11	57	2736.0 21.89
58	2557.8 20.46	58	2784.0 22.27
59	2601.9 20.82	59	2832.0 22.66
60	2646.0 21.17	60	2880.0 23.04

Table 3-2: Available Constant Bit Rates (31-60 Bytes BlockWidth)

The Table 3-2 above describes bit rates for both 44.1 kHz and 48 kHz networks.

MOST25

The maximum BlockWidth for MOST25 is 60, as depicted in the table.

MOST50

The maximum Blockwidth for MOST50 is 117. In a 44.1 kHz network, for example, this results in a bit rate of 5051.7 KBps.

4 Transmission classes

4.1 Synchronous

The frame structure of the data is directly locked to the physical frame structure of the MOST network. This is the straightforward realtime streaming method MOST offers. Typically the sources and sinks are driven by the unique MOST network clock. The complete system runs synchronous using the same clock domain.

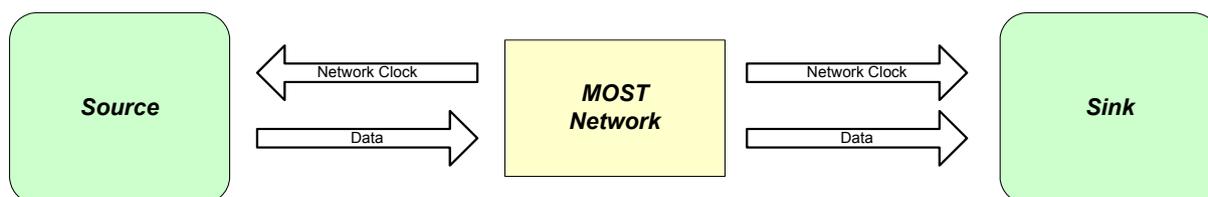


Figure 4-1: Synchronous Data Transmission

4.2 Isochronous

Data, which cannot be easily synchronized to the MOST system clock before distribution over the MOST network, is called isochronous data. The timing of the data is typically not locked to the physical frame structure of the MOST network and it is even not required that the data is organized in frames. To distribute such data over the MOST network, it is packetized by the source before transmission and a special protocol is used to realize the transmission of these packets over a synchronous channel of the MOST network. Please see Chapter 6: The Stream Associated Data channel (SAD) on details of this protocol.

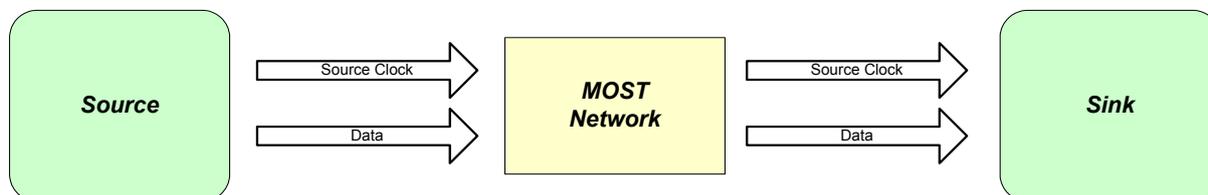


Figure 4-2: Isochronous Data Transmission

5 Sequence of Stream Data on MOST

The sequence of data for streams on MOST is ordered with the following priorities:

1. Sampling time
2. Bit order

For 'low sample rate' or 'small bandwidth' audio special rules apply, see chapter 5.3 for details.

5.1 Sampling Time Sort Criteria

For isochronous streams, the sequence of data is 'byte by byte in ascending order'. For synchronous streams of different sampling frequency, the data samples are ordered by their sampling time.

Example:

Data of synchronous stream A is sampled with 1x FS

Data of synchronous stream B is sampled with 2x FS

Data of synchronous stream C is sampled with 4x FS

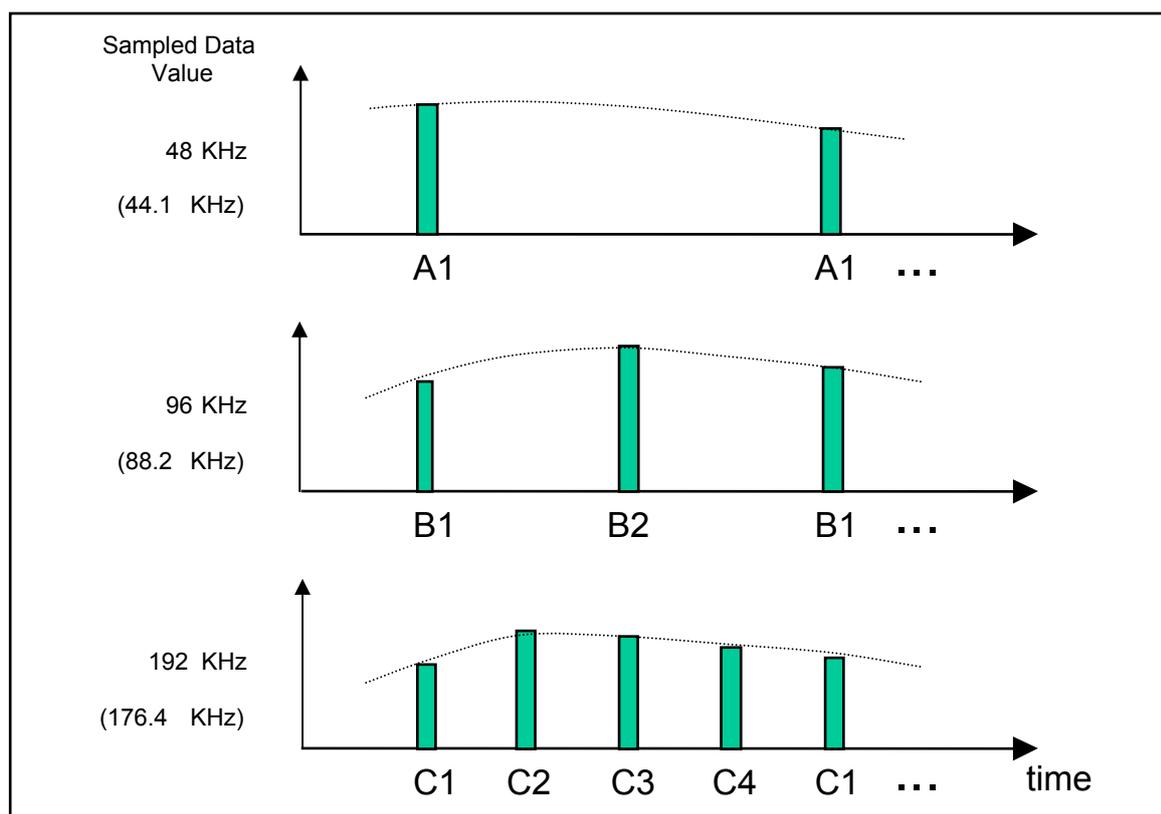


Figure 5-1: Three Channels with Different FS

The samples A1, B1, and C1 are taken at the same time. The same applies to the samples B2 and C3.

The resulting sequence of data for the transmission of all three channels with different FS according to Figure 5-1 via MOST would be:

Frame 0: {A1, B1, C1}, C2, {B2, C3}, C4

Frame 1: {A1, B1, C1}, C2, {B2, C3}, C4

Frame 2: {A1, B1, C1}, C2, {B2, C3}, C4

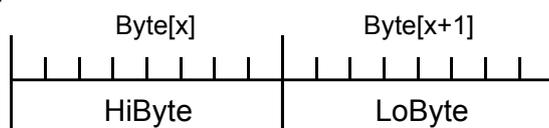
Frame 3: ...

5.2 Bit Order Sort Criteria

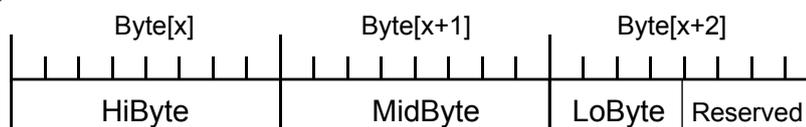
The samples of a channel are ordered for transmission via MOST as follows:

- HiByte down to LoByte
- Bits are aligned MSB first
- Data is left-adjusted
- Unused bits are set to "0b"

16bits/sample

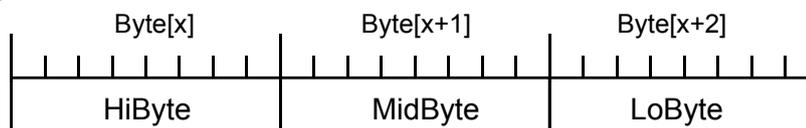


20bits/sample



Please note:
Reserved bits must be set to "0b"

24bits/sample



Example:

Given are the audio signals from chapter 5.1 with the following resolutions:

Stream A: 24bits/sample
Stream B: 24bits/sample
Stream C: 16bits/sample

The resulting sequence of data for the transmission via MOST would be:

Frame 0: {A1_{Hi-Mid-Lo}, B1_{Hi-Mid-Lo}, C1_{Hi-Lo}}, C2_{Hi-Lo}, {B2_{Hi-Mid-Lo}, C3_{Hi-Lo}}, C4_{Hi-Lo}
 Frame 1: {A1_{Hi-Mid-Lo}, B1_{Hi-Mid-Lo}, C1_{Hi-Lo}}, C2_{Hi-Lo}, {B2_{Hi-Mid-Lo}, C3_{Hi-Lo}}, C4_{Hi-Lo}
 Frame 2: {A1_{Hi-Mid-Lo}, B1_{Hi-Mid-Lo}, C1_{Hi-Lo}}, C2_{Hi-Lo}, {B2_{Hi-Mid-Lo}, C3_{Hi-Lo}}, C4_{Hi-Lo}
 Frame 3: ...

5.3 Sequence of Data for Special Audio Formats

This sequence of data can be used for bandwidth efficient transmission of multiple channels with a sample rate of $FS/2$ or $FS/4$. The MOST bandwidth is used in a time-multiplexed manner. Synchronization is done using the LSB of the first audio channels first sample. This lowers the effective audio resolution to 15 / 14 bits.

5.3.1 Low Sample Rate Audio (15 bit, $FS/2$ or $FS/4$)

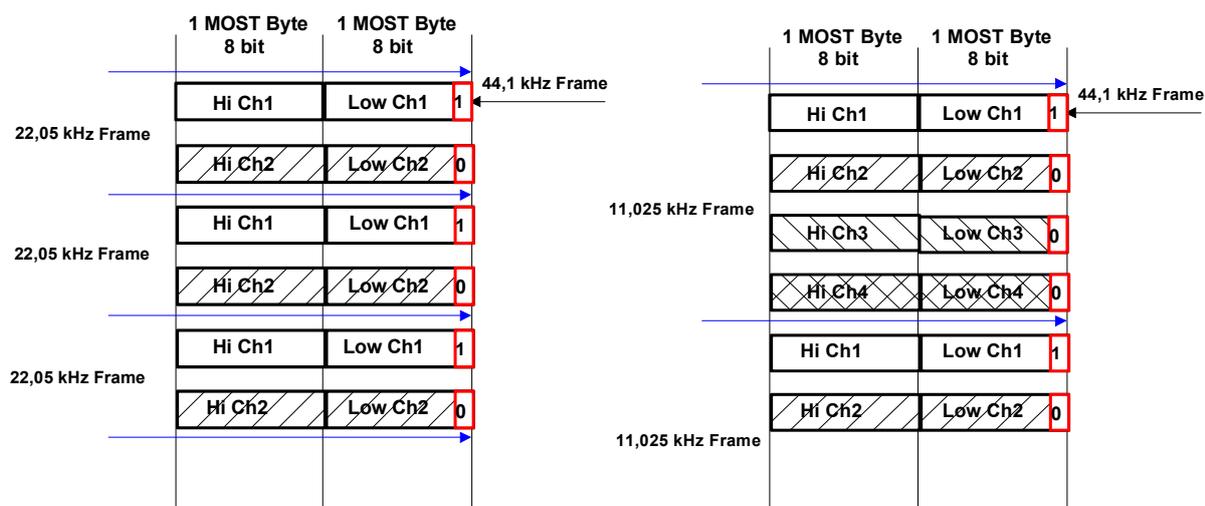


Figure 5-2: Low Sample Rate Audio (15 Bit, $FS/2$ or $FS/4$)

5.3.2 Small Bandwidth Audio (14 bit, FS/2 or FS/4)

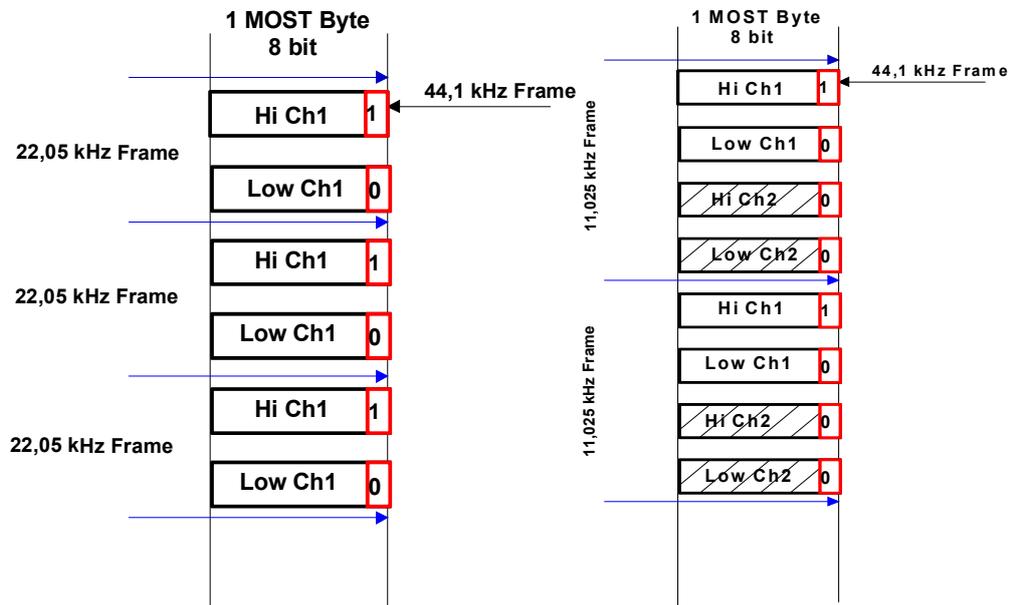


Figure 5-3: Small Bandwidth Audio (14 bit, FS/2 or FS/4)

5.4 Discrete Frame Streams

General rule:

Discrete Frame streams must be synchronized to the MOST FS before transmitting over MOST

The SourceInfo property features the parameter 'DataType' to describe the synchronous streams in the table below. Note: If the SourceInfo property is not implemented by the source, 'Audio' is the default data type.

Code (1 Byte)	Description
0x00	Audio
0x01	CD ROM
0x02	S/PDIF
0x10	GenericPCM
0x11	GenericPCM protected by DTCP

Table 5-1: DataType definitions for Discrete Frame streams

5.4.1 Audio

This data type is also known as PCM or StereoPCM. The MOST Network Interface Controller is able to receive many different audio formats and convert them to their raw data format or to generate many different audio formats from the transported raw data. For audio transmissions, the following minimum agreements are valid:

- Audio-NF will be transported CD-DA compatible (Compact Disk Digital Audio)
- The sequence of channels is: Front left, front right, rear left, rear right.

5.4.1.1 DataDescription

DataDescription := {Resolution, AudioChannels, SrcDelay, ChannelList}

Resolution

Specifies the resolution of the audio samples in bytes

Basic Data Type: Unsigned Byte

AudioChannels

Specifies the number of the audio channels, e.g., 1 for mono, 2 for stereo etc.

Basic Data Type: Unsigned Byte

SrcDelay

Specifies the delay of the synchronous data with respect to the Timing Master. Each MOST Network Interface Controller keeps track of the mode delay.

Basic Data Type: Unsigned Byte

MOST25

ChannelList

List of synchronous MOST channels (bytes) in use. If the channel is not allocated/connected it contains the value 0xFF.

Basic Data Type: Stream (60 Bytes)

ChannelList := <Channel> {, <Channel> }

Channel

Number of a data byte in the MOST frame

Basic Data Type: Unsigned Byte

MOST50

ChannelList

Block width and connection label for the streaming connection.

Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

BlockWidth50

Number of transferred bytes per MOST frame.

Basic Data Type: Unsigned Word

ConnectionLabel

Connection identifier.

Basic Data Type: Unsigned Word

Example 1:

16 Bit Stereo: Resolution = 0x02, AudioChannels = 0x02

Sequence of data:

Channel0: 16 Bit Word, Left audio channel

Channel1: 16 Bit Word, Right audio channel

Sequence of data:

MSB left, LSB left, MSB right, LSB right

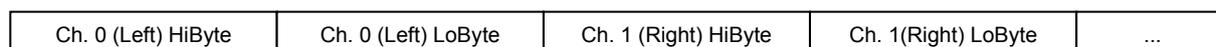


Figure 5-4: Sequence of CD-Audio Samples

Example 2:

24 Bit Stereo: Resolution = 0x03, AudioChannels = 0x02

Sequence of data:

MSB left, Central Byte left, LSB left, MSB right, Central Byte right, LSB right

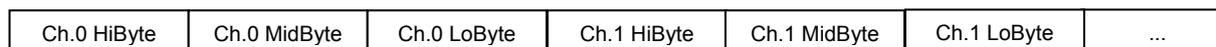


Figure 5-5: Sequence of 24 bit PCM Samples

5.4.2 CD ROM

This data type describes CD-ROM raw data before being processed by a CD-ROM decoder. This data might be of type audio, CD-I or Video-CD.

Note: Should not be used anymore for new implementations.

5.4.2.1 DataDescription

DataDescription := {BlockWidth, ChannelList}

MOST25

BlockWidth

Specifies the number of transmitted bytes per MOST frame. Per default, a BlockWidth of 0x04 will be assumed.

Basic Data Type: Unsigned Byte

ChannelList

List of synchronous MOST channels (bytes) in use. If the channel is not allocated/connected it contains the value 0xFF.

Basic Data Type: Stream (60 Bytes)

ChannelList := <Channel> {, <Channel> }

Channel

Number of a data byte in the MOST frame.

Basic Data Type: Unsigned Byte

MOST50

BlockWidth

Must be 0x00 for MOST50.

Basic Data Type: Unsigned Byte.

ChannelList

Block width and connection label for the streaming connection.

Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

BlockWidth50

Number of transferred bytes per MOST frame.

Basic Data Type: Unsigned Word

ConnectionLabel

Connection identifier.

Basic Data Type: Unsigned Word

Examples:

Single Speed CD: BlockWidth = 0x04

Double Speed CD: BlockWidth = 0x08

Sequence of data:

Channel0: 16 Bit Word (n * 2) + 0

Channel1: 16 Bit Word (n * 2) + 1

Ch. 0 (Word 0) HiByte	Ch. 0 (Word0) LoByte	Ch. 1 (Word1) HiByte	Ch. 1(Word1) LoByte	...
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Figure 5-6: Sequence of CD-ROM Samples

5.4.3 Generic PCM

The ordering of audio samples is defined in the previous sections. This ordering and additional information is described by the GenericPCM datatype, which is given below. Both the DataType and the DataDescription fields can be directly used in the functions SourceInfo and SinkInfo of the MOST Function Catalog.

5.4.3.1 DataDescription

DataDescription := {AudioChannels, AudioChannelList, SrcDelay, BlockWidth, ChannelList}

AudioChannels

Number of audio channels (e.g., 6 stands for 6-channel audio)
Please note: 5.1 audio results in 6-channel audio.
Basic Data Type: Unsigned Byte

AudioChannelList

Describes every audio channel in the multi-channel audio signal. The number of audio channels is given by the parameter AudioChannels.

AudioChannelList := <AudioChannelName>, <BitsPerSample>, <SampleRateMultiplier>
{, <AudioChannelName>, <BitsPerSample>, <SampleRateMultiplier>}

AudioChannelName

This parameter specifies the intended playback location of this group of channels. Several external standards define parts of the following master channel layout. Please find the mapping for common multi channel signals in the next paragraph.
Basic Data Type: Enum (1 Byte)

Enum	Position	Abbreviation
0x00	Channel currently not in use	-
0x01	Front Left	FL
0x02	Front Right	FR
0x03	Front Center	FC
0x04	Low Frequency	LF
0x05	Back Left	BL
0x06	Back Right	BR
0x07	Front Left of Center	FLC
0x08	Front Right of Center	FRC
0x09	Back Center	BC
0x0A	Side Left	SL
0x0B	Side Right	SR
0x0C	Top Center	TC
0x0D	Top Front Left	TFL
0x0E	Top Front Center	TFC
0x0F	Top Front Right	TFR
0x10	Top Back Left	TBL
0x11	Top Back Center	TBC
0x12	Top Back Right	TBR
0x13	Back Left of Center	BLC
0x14	Back Right of Center	BRC

Table 5-2: AudioChannelName

BitsPerSample

Specifies the number of bits per PCM sample (e.g., 24 stands for 24 bits resolution).
 Basic Data Type: Unsigned Byte

SampleRateMultiplier

Number of complete PCM samples of one audio channel per network frame. This parameter is only applicable in the synchronous transmission class, when signals with a multiple sample rate of the network frequency are transported (e.g., 96 kHz PCM data is transported using a 48 kHz MOST network). For PCM transmissions using the isochronous class, this parameter is defined to be always '0x00'.

Enum Code	Description
0x00	1
0x01	Reserved
0x02	2
0x03	3
0x04	4
0x05	5
0x06	6
...	
0x81	Reserved
0x82	1/2
0x83	1/3
0x84	1/4
0x85	1/5
...	
	...

Table 5-3: SampleRateMultiplier

SrcDelay

Delay of synchronous data related to the Timing Master.
 Remark: The parameter SrcDelay represents the register NPR.

Basic Data Type: Unsigned Byte

BlockWidth Number of transferred byte per MOST frame.

In case of unprotected content (no DTCP), this number is given by the number of audio data bytes per MOST frame. In case of DTCP protected content, this number is given by the number of audio data bytes per MOST frame plus 2 Bytes (1 Header channel byte + 1 Info channel byte).

Basic Data Type: Unsigned Byte

MOST25

ChannelList

List of synchronous MOST channels (bytes) in use by this source. If the source is not allocated, each channel contains the value 0xFF.

Basic Data Type: Stream (60 Bytes)

ChannelList := <Channel> {, <Channel> }

Channel

Number of a data byte in the MOST frame
Basic Data Type: Unsigned Byte

MOST50

ChannelList

Block width and connection label for the streaming connection.
Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

BlockWidth50

Number of transferred bytes per MOST frame.
Basic Data Type: Unsigned Word

ConnectionLabel

Connection identifier.
Basic Data Type: Unsigned Word

5.4.3.2 Mapping and Usage of the Generic PCM Datatype

The following tables define how common multi channel signals are mapped to multiple Generic PCM streams to be used on MOST.

Dolby Digital - AC3

AC3 Channel name	MOST AudioChannelName
L (Left)	FL
R (Right)	FR
C (Center)	FC
S (Surround)	BC
SL (Left surround)	BL
SR (Right surround)	BR
Mo	FC
Mo1	Not supported
Mo2	Not supported
LFE	LF

Table 5-4: Mapping of Dolby Digital – AC3

Dolby Digital Plus - DD+, Dolby True HD – TrueHD

Dolby Digital Channel name	MOST AudioChannelName
L (Left)	FL
R (Right)	FR
C (Center)	FC
Ls (Left surround)	BL
Rs (Right surround)	BR
Lb (Left back)	BLC
Rb (Right back)	BRC
LFE	LF

Table 5-5: Mapping of Dolby Digital Plus, Dolby True HD – DD+, TrueHD for a standard 7.1 channel set

DTS, DTS ES, DTS NEO:6

DTS Channel name	MOST AudioChannelName
Left channel	FL
Right channel	FR
Center channel	FC
Left surround	BL
Right surround	BR
Center surround	BC
Sub woofer	LF

Table 5-6: Mapping of DTS, DTS ES, DTS NEO:6

DTS HD

DTS Channel name	MOST AudioChannelName
L (Left)	FL
R (Right)	FR
C (Center)	FC
Ls (Left surround)	BL
Rs (Right surround)	BR
Lb (Left back)	BLC
Rb (Right back)	BRC
LFE	LF

Table 5-7: Mapping of DTS HD for a standard 7.1 channel set

MPEG2 Audio

MPEG2 Audio Channel name	MOST AudioChannelName
L (Left)	FL
R (Right)	FR
C (Center)	FC
LS (Left surround)	BL
RS (Right surround)	BR
LFE	LF

Table 5-8: Mapping of MPEG2 Audio

DVD-Audio

DVD-Audio Channel name	MOST AudioChannelName
L (Left)	FL
R (Right)	FR
Lf (Left front)	FL
Rf (Right front)	FR
S (Surround)	BC
Ls (Left surround)	BL
Rs (Right surround)	BR
C (Center)	FC
LFE (Low Frequency Effect)	LF

Table 5-9: Mapping of DVD-Audio

SACD

SACD Channel name	MOST AudioChannelName
Left	FL
Right	FR
Center	FC
Left surround	BL
Right surround	BR
LFE	LF

Table 5-10: Mapping of SACD

5.5 Packetized Streams

The SourceInfo property features the parameter 'DataType' to describe the packetized streams in the table below.

Code (1 Byte)	Description
0x20	MPEG1_SystemStream
0x21	MPEG2_ProgramStream
0x22	MPEG2_TransportStream
0x40	MPEG1_SystemStream protected by DTCP
0x41	MPEG2_ProgramStream protected by DTCP
0x42	MPEG2_TransportStream protected by DTCP

Table 5-11: DataType definitions for Packetized Streams

The 'MPEG System Layer' is defined by the ISO/IEC standard:

ISO/IEC 11172-1 for MPEG1 system (i.e., MPEG1 SystemStream)

ISO/IEC 13818-1 for MPEG2 systems (i.e., MPEG2 ProgramStream / TransportStream)

For transmission of MPEG4 streams over the MOST network, the MPEG2 System Layer shall be used. Please refer to Amendment 7 of the MPEG2 Systems specification (ISO/IEC 13818-1 / FDAM7, January 2000) for encapsulation of MPEG4 (ISO/IEC14496) compliant streams inside MPEG2 SystemStreams. The availability of all known MPEG4 features is given without any restrictions.

5.5.1 MPEG1_SystemStream (ISO/IEC 11172-1)

This generic format consists of a multiplex of multiple MPEG1 packetized elementary streams. A constraint form of the MPEG1 SystemStream can be found embedded in the CDROM/XA sectors of a VideoCD.

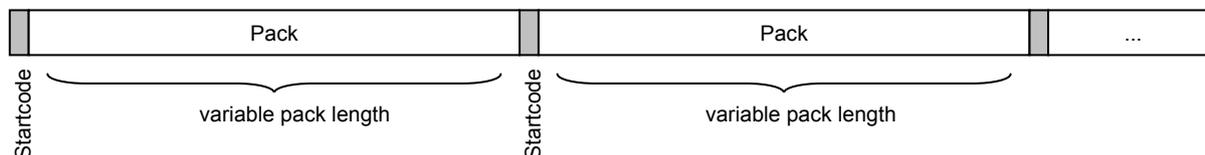


Figure 5-7: Data Type Definition for MPEG1_SystemStream

5.5.1.1 DataDescription

DataDescription := {BlockWidth, ChannelList}

MOST25

BlockWidth

Number of transferred byte per MOST Frame.

In case of unprotected content (no DTCP), this number is given by the number of data bytes per MOST Frame. In case of DTCP protected content, this number is given by the number of data bytes per MOST Frame plus 2 Bytes (1 Header channel byte + 1 Info channel byte).

Basic Data Type: Unsigned Byte

ChannelList

List of synchronous MOST channels (bytes) in use by this source. If the source is not allocated, each channel contains the value 0xFF.

Basic Data Type: Stream (60 Bytes)

ChannelList := <Channel> {, <Channel> }

Channel

Number of a data byte in the MOST Frame

Basic Data Type: Unsigned Byte

MOST50

BlockWidth

Must be 0x00 for MOST50.

Basic Data Type: Unsigned Byte.

ChannelList

Block width and connection label for the streaming connection.

Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

<p>BlockWidth50 Number of transferred bytes per MOST frame. Basic Data Type: Unsigned Word</p> <p>ConnectionLabel Connection identifier. Basic Data Type: Unsigned Word</p>

5.5.2 MPEG2_ProgramStream (ISO/IEC 13818-1)

The generic MPEG2 ProgramStream is similar to the MPEG1 SystemStream but uses a modified syntax and new functions. However, compatibility with the MPEG1 SystemStream is provided. Therefore, MPEG2 decoders can be also used to decode MPEG1 SystemStreams. The MPEG2 ProgramStream is used by DVD-Video and Super VideoCD standard applications.

One MPEG2 ProgramStream Pack may consist of multiple Packets and can be variable in length.

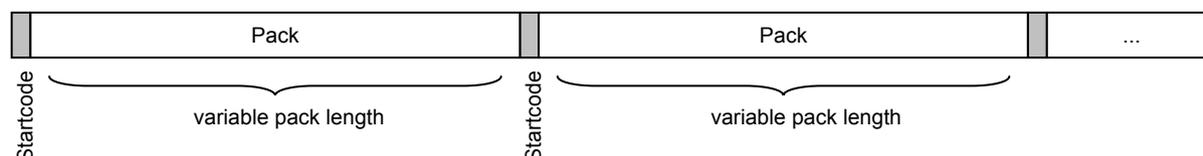


Figure 5-8: Data Type Definition for MPEG2_ProgramStream

5.5.2.1 DataDescription

DataDescription := {BlockWidth, ChannelList}

<p>MOST25</p> <p>BlockWidth Number of transferred byte per MOST Frame. In case of unprotected content (no DTCP), this number is given by the number of data bytes per MOST Frame. In case of DTCP protected content, this number is given by the number of data bytes per MOST Frame plus 2 Bytes (1 Header channel byte + 1 Info channel byte). Basic Data Type: Unsigned Byte</p> <p>ChannelList List of synchronous MOST channels (bytes) in use by this source. If the source is not allocated, each channel contains the value 0xFF. Basic Data Type: Stream (60 Bytes)</p> <p><i>ChannelList := <Channel> {, <Channel> }</i></p> <p>Channel Number of a data byte in the MOST Frame Basic Data Type: Unsigned Byte</p>

MOST50

BlockWidth

Must be 0x00 for MOST50.
 Basic Data Type: Unsigned Byte.

ChannelList

Block width and connection label for the streaming connection.
 Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

BlockWidth50

Number of transferred bytes per MOST frame.
 Basic Data Type: Unsigned Word

ConnectionLabel

Connection identifier.
 Basic Data Type: Unsigned Word

5.5.3 MPEG2_TransportStream (ISO/IEC 13818-1)

The MPEG2 TransportStream is used for an example by DVB-T standard applications.

A MPEG2 TransportStream consists of fixed-sized packets with a length of 188 bytes (4 bytes header / 184 bytes payload).

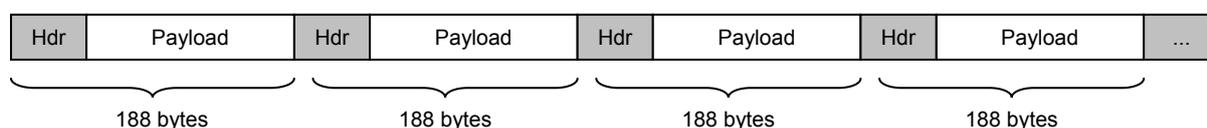


Figure 5-9: Data Type Definition for MPEG2_TransportStream

5.5.3.1 DataDescription

DataDescription := {BlockWidth, ChannelList}

MOST25

BlockWidth

Number of transferred byte per MOST Frame.

In case of unprotected content (no DTCP), this number is given by the number of data bytes per MOST Frame. In case of DTCP protected content, this number is given by the number of data bytes per MOST Frame plus 2 Bytes (1 Header channel byte + 1 Info channel byte).

Basic Data Type: Unsigned Byte

ChannelList

List of synchronous MOST channels (bytes) in use by this source. If the source is not allocated, each channel contains the value 0xFF.

Basic Data Type: Stream (60 Bytes)

ChannelList := <Channel> {, <Channel> }

Channel

Number of a data byte in the MOST Frame

Basic Data Type: Unsigned Byte

MOST50

BlockWidth

Must be 0x00 for MOST50.

Basic Data Type: Unsigned Byte.

ChannelList

Block width and connection label for the streaming connection.

Basic Data Type: Stream

ChannelList := {BlockWidth50, ConnectionLabel}

BlockWidth50

Number of transferred bytes per MOST frame.

Basic Data Type: Unsigned Word

ConnectionLabel

Connection identifier.

Basic Data Type: Unsigned Word

5.5.4 Elementary Layer Streams

Two types of elementary streams are defined by each ISO/IEC MPEG standard:

- ISO/IEC 11172-2 for MPEG1 Video
- ISO/IEC 11172-3 for MPEG1 Audio

- ISO/IEC 13818-2 for MPEG2 Video
- ISO/IEC 13818-3 for MPEG2 Audio

Additionally to the MPEG standards, other types of streams exist, which have equivalent elementary characteristics (e.g., AC3 or DTS). Inside an MPEG2 System multiplex they are handled as 'PrivateStreams'.

No definition is given in this document for direct (non-encapsulated) streaming of elementary streams of compressed video or compressed audio

5.5.4.1 Compressed Video (ISO/IEC 11172-2 and ISO/IEC 13818-2)

Not specified for MOST on elementary level since a System Layer stream is better suited in terms of synchronization/stuffing and device compatibility.

5.5.4.2 Compressed Audio (E.g., AC3, DTS, ISO/IEC 11172-3)

- Can be decoded to PCM, synchronized to the MOST network's clock domain and transferred using a synchronous channel
- Can be transferred using an isochronous channel
- Can be transmitted using a MPEG System Layer

6 The Stream Associated Data Channel (SAD)

The stream associated data channel is a generic synchronous stream that is used to deliver additional information of other streams on MOST with a direct timing relation on frame basis.

The Stream Associated Data Channel is part of the same synchronous connection as the actual data. No additional synchronous connections need to be established.

6.1 Isochronous transmission protocol

The isochronous payload is packetized into fixed sized chunks with a maximum size of 256 bytes. For transmission over a synchronous channel of the MOST network, a Stream Associated Data channel (SAD) is applied.

This SAD is dedicated as a signaling channel to mark the start of a packet. A four byte header including two unique sync-bytes (0x3C, 0xB2) and two reserved bytes are leading a packet. See the picture below for the alignment.

While the packet length is fixed, the gap between two packets can be variable. Packets always start at the first byte position in the frame, but depending on the packet size, are not required to end exactly at the last position of the frame.

Adjusting the packetsize to an exact multiple of the Blockwidth ($n \cdot BW$) and with a gap of zero length between the packets, a synchronous MOST channel can be virtually 'packetized'. MOST-DTCP uses that scheme to signal the single DTCP packets in the synchronous stream.

Frame	SAD	Byte [0]	Byte [1]	Byte [2]	Byte [3]
1	0x3C				
2	0xB2				
3	reserved				
4	reserved				
5		Data [0]	Data [1]	Data [2]	Data [3]
6		Data [4]	Data [5]	Data [6]	Data [7]
7		Data [8]	Data [9]	Data [10]	Data [11]
8		Data [12]	Data [13]	Data [14]	Data [15]
9		Data [16]	Data [17]	Data [18]	Data [19]
10		Data [20]	Data [21]	Data [22]	Data [23]
11		Data [24]	Data [25]	Data [26]	Data [27]
12		Data [28]	Data [29]	Data [30]	Data [31]
13					
14					
15					
16	0x3C				
17	0xB2				
18	reserved				
19	reserved				
20		Data [0]	Data [1]	Data [2]	Data [3]
21		Data [4]	Data [5]	Data [6]	Data [7]
22		Data [8]	Data [9]	Data [10]	Data [11]
23		Data [12]	Data [13]	Data [14]	Data [15]
24		Data [16]	Data [17]	Data [18]	Data [19]
25	0x3C	Data [20]	Data [21]	Data [22]	Data [23]
26	0xB2	Data [24]	Data [25]	Data [26]	Data [27]
27	reserved	Data [28]	Data [29]	Data [30]	Data [31]
28	reserved				
29		Data [0]	Data [1]	Data [2]	Data [3]
30		Data [4]	Data [5]	Data [6]	Data [7]
31		Data [8]	Data [9]	Data [10]	Data [11]
32		Data [12]	Data [13]	Data [14]	Data [15]
33		Data [16]	Data [17]	Data [18]	Data [19]
34		Data [20]	Data [21]	Data [22]	Data [23]
35		Data [24]	Data [25]	Data [26]	Data [27]
36		Data [28]	Data [29]	Data [30]	Data [31]
37					
38					

variable gap
fixed length

Figure 6-1: Example for a packetized isochronous transmission (BW = 5)

6.2 Embedded Info Area for GenericMOST-DTCP

An SAD channel called 'Info' is added to the raw data. This embedded info area is needed by the Generic MOST-DTCP. These info bytes carry stream information, which is not available inside the raw content. Examples are the 'Embedded CCI' or the 'ISRC data' sections for Generic MOST-DTCP.

6.3 IEC958 (S/PDIF)

To implement a transparent IEC958 transmission, the VUCP bits and the Preamble are transferred in addition to the raw audio samples / stream bytes in a separate SAD channel.



Figure 6-2: IEC958 (S/PDIF) Sequence

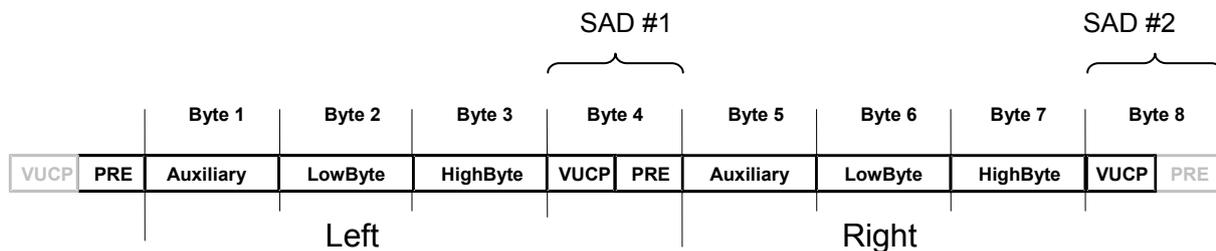


Figure 6-3: Transmission of IEC958 Data Using two SAD Channels

7 Content Protection for Streams on MOST

7.1 IEC958 Serial Copy Management (S/PDIF SCM)

IEC958 compliant streams are transferred through MOST in a transparent manner. Therefore the generic IEC958 serial copy management system (CSS and CPPM compliant) is available.

7.2 Digital Transmission Content Protection (5C DTCP)

Please refer to the

- 'MOST ContentSecurity' specification and
- 'MOST ContentProtectionScheme DTCP' specification

for the definition of the generic 5C DTCP implementation for MOST.

This chapter defines how the generic MOST-DTCP specification is applied to the specific media/stream application.

7.2.1 Definition of Media Types

MediaType is used for contents which require embedded CCI (copy control information) inside the stream. For all others, the default media type is applied.

Media Types	Value
Not defined (default)	0x00
DVD-Video (MPEG A/V multiplex)	0x10
Video of DVD-Video	0x11
Audio of DVD-Video	0x12
DVD-Audio	0x20
(reserved)	0x21
Audio of DVD-Audio	0x22
SACD	0x30
DVB (MPEG A/V multiplex)	0x40
Video of DVB	0x41
Audio of DVB	0x42

All other values are reserved.

Table 7-1: Mapping of Media Types

7.2.2 DVD-Video Parameters (Video/Audio MPEG System Multiplex)

MOST-DTCP mode

Generic MOST-DTCP Packet Format is used to wrap the info bytes and the MPEG data.

Embedded Information

Number of Info bytes: 4

Info [0]	Number of Info bytes following	set to 0x03
Info [1]	MediaType	set to 'DVD-Video'
Info [2]	Bits[7..0]	Bits[7..0] of the field 'private_data_byte' ¹
Info [3]	Bits[7..0]	Bits[15..8] of the field 'private_data_byte' ¹

Table 7-2: Embedded Information of DVD-Video Parameters (Video/audio MPEG System Multiplex)

DTCP Encryption Frame Size

192 bytes is the DTCP encryption frame size.

MOST-DTCP Packet Length

$$PacketLength = \frac{192 \cdot BW}{BW - 1} \quad (BW = \text{Allocated BlockWidth})$$

The following BlockWidth settings are available:

BlockWidth (BW)	Number of MOST frames per Packet	Number of payload bytes (BW – SAD0/SAD1)
5	48	3
7	32	5
9	24	7
13	16	11
17	12	15
25	8	22
33	6	31
49	4	47

MOST50

For MOST50, the table contains two additional lines.

BlockWidth (BW)	Number of MOST frames per Packet	Number of payload bytes (BW – SAD0/SAD1)
65	3	63
97	2	95

¹ The coding of these fields is given in the document 'Digital Transmission Content Protection Specification', Revision 1.2, July 11, 2001: Appendix B, Table 24, Syntax of private_data_byte for DTCP_descriptor.

7.2.3 DVD-Video Parameters (Decoded LPCM Audio Only)

MOST-DTCP mode

Generic MOST-DTCP Packet Format is used to wrap the info bytes and the audio samples.

Embedded Information

Number of Info bytes: 8

Info [0]	Number of Info bytes following	set to 0x07
Info [1]	MediaType	set to 'Audio of DVD-Video'
Info [2]	Bits[7...6]	CGMS
	Bits[5...0]	reserved, set to 0x00
Info [3]	Reserved	set to 0x00
Info [4]	Reserved	set to 0x00
Info [5]	Reserved	set to 0x00
Info [6]	Reserved	set to 0x00
Info [7]	Reserved	set to 0x00

Table 7-3: Embedded Information of DVD-Video Parameters, Decoded LPCM Audio only

DTCP Encryption Frame Size

8 bytes is the DTCP encryption frame size.

MOST-DTCP Packet Length

$$PacketLength = 8 \cdot BW$$

(BW = Allocated BlockWidth)

7.2.4 DVD-Audio Parameters

MOST-DTCP mode

Generic MOST-DTCP Packet Format is used to wrap the info bytes and the audio samples.

Embedded Information

Number of Info bytes: 8

Info [n]	Field	Value
Info [0]	Number of Info bytes following	set to 0x07
Info [1]	MediaType	set to 'Audio of DVD-Audio'
Info [2]	Bits [7...6]	CCI (audio_copy_permission)
	Bits [5..3]	CCI (audio_copy_number)
	Bits [2..1]	CCI (audio_quality)
	Bit [0]	CCI (audio_transaction)
Info [3]	Bits [7..5]	ISRC (ISRC_Status)
	Bits [4..0]	ISRC (UPC_EAN_ISRC_number)
Info [4]	Bits [7..0]	ISRC (UPC_EAN_ISRC_data)
Info [5]	Reserved	set to 0x00
Info [6]	Reserved	set to 0x00
Info [7]	Reserved	set to 0x00

Table 7-4: Embedded Information of DVD-Audio Parameters

Two types of information must be mapped onto the info bytes when transmitting DVD-audio contents:

- Copy Control Information (CCI)
- International Standard Recording Code (ISRC), also known as ISO 3901 standard

Field	No. of bits	Description
audio_copy_permission	2 Bits	Whether copying is permitted or not
audio_copy_number	3 Bits	Permitted times of copying
audio_quality	2 Bits	Permitted audio quality of copying
audio_transaction	1 Bit	Status of the optional access control for audio data
ISRC_Status	3 Bits	Position in a ISRC period
UPC_EAN_ISRC_number	5 Bits	Contents identification data
UPC_EAN_ISRC_data	8 Bits	

Table 7-5: Coding of (Embedded) CCI Field

Please note:

The ISRC fields are defined in 'DVD-Audio Specifications Version 1.2'

DTCP Encryption Frame Size

8 bytes is the DTCP encryption frame size.

MOST-DTCP Packet Length

$$PacketLength = 8 \cdot BW \quad (BW = \text{Allocated BlockWidth})$$

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