

Advanced Access Content System (AACCS)

Blu-ray Disc Pre-recorded Book

Intel Corporation

International Business Machines Corporation

Microsoft Corporation

Panasonic Corporation

Sony Corporation

Toshiba Corporation

The Walt Disney Company

Warner Bros.

Revision 0.953

Final

October 26, 2012

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Preface

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Contact Information

Please address inquiries, feedback, and licensing requests to AACS LA LLC:

- Licensing inquiries and requests should be addressed to licensing@aacsla.com.
- Feedback on this specification should be addressed to comment@aacsla.com.

The URL for the AACS LA LLC web site is <http://www.aacsla.com>.

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Chapter 1

Introduction

1.1 Purpose and Scope

The Advanced Access Content System (AACS) specification defines an advanced, robust and renewable method for protecting audiovisual entertainment content, including high-definition content. The specification is organized into several “books”. The AACS *Introduction and Common Cryptographic Elements* book defines cryptographic procedures that are common among the various defined uses of the protection system. The *Pre-recorded Video Book* defines common details for using the system to protect audiovisual content distributed on any kind of pre-recorded (read-only) storage media. This document (the *Blu-ray Disc Pre-recorded Book*) specifies additional details for using the system to protect audiovisual content distributed on pre-recorded Blu-ray Disc Read-Only Media.

When there is a discrepancy between a format-independent book and this book, then this book takes precedence.

The use of this specification and access to the intellectual property and cryptographic materials required to implement it are the subject of a license. A license authority referred to as AACS LA is responsible for establishing and administering the content protection system based in part on this specification.

Note: In this specification the words “BD Pre-recorded Disc” means Blu-ray Disc Read-Only Media (BD-ROM).

1.2 Overview

In the *Blu-ray Disc Pre-recorded Book*, the following described procedures are required to protect AACS Pre-recorded Video Content.

- Content Revocation
- Content Encryption and Decryption
- Uses of On-line Connections
- Managed Copy
- Sequence Keys

This document is provided as a detailed description of procedures and data structures that are specific for the use of the AACS technology on Blu-ray Disc Read-Only Media.

1.3 Organization of this Document

This document is organized as follows:

- Chapter 1 provides an introduction and overview.
- Chapter 2 describes Blu-Ray Disc specific procedures related to the revocation of pre-recorded video.
- Chapter 3 describes Blu-Ray Disc specific procedures for the production (encryption) and off-line playback (decryption) of AACS Content on pre-recorded Blu-Ray Read Only Media.

- Chapter 4 describes Blu-Ray Disc specific procedures for the use of AACS Content with network transactions.
- Chapter 5 describes Blu-ray Disc specific procedure for the Managed Copy of AACS Pre-recorded Content.
- Chapter 6 describes Blu-ray Disc specific procedure for Sequence Keys.
- Chapter 7 describes clarifications for unencrypted content
- Chapter 8 describes Blu-ray Disc specific 3D feature.

1.4 Reference

This specification shall be used in conjunction with the following publications. When the publications are superseded by an approved revision, the revision shall apply.

AACS LA, Introduction and Common Cryptographic Elements

AACS LA, Pre-recorded Video Book

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 1: Basic Format Specifications, version 1.3

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 2: File System Specifications, version 1.2

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, Part 3: Audio Visual Basic Specifications, Version 2.4

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, Part 3: Audio Visual Basic Specifications Version 2.4 for 2D

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, Part 3: Audio Visual Basic Specifications, Version 2.4, Guidelines

Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, Part 3: Audio Visual Basic Specifications, Version 2.4 for 2D, Guidelines

ROM-Mark Outline, version 1.0

KCD-Mark Outline, version 1.0

Digital Transmission Licensing Administrator, Digital Transmission Content Protection Specification Volume 1 Revision 1.4

1.5 Document History

This document version 0.953 supersedes version 0.952 dated July 14, 2011, and contains the following changes:

- maxOccurs of MCUALL element is changed to 256 in the MCMF XML Schema in Section 5.3.1
- Region element and its description are deleted in Section 5.3.1
- Description of age element is clarified in Section 5.3.1.1
- Web Service Description in Section 5.4.1 is modified:
 - sessionID is added to RequestOffers
 - CheckSerialNumber is deleted
- Offer Response Message in Section 5.4.2 is modified:

- maxOccurs of render element is added
- serialNumber and AACObjectAttributes elements are added
- type of MKB attribute is changed to base64Binary
- serialNumberStatus element is deleted

Document version 0.952 superseded version 0.951 dated January 12, 2010, and contained the following changes:

- Content ID attribute is now optional in the Managed Copy Manifest File.
- Managed Copy Manifest File is now also optional.
- New elements are defined in the MCMF XML Schema, and their descriptions are added in Section 5.3.
- Definitions for “three_d_only” and “three_d_full_frame_only” bits added in Section 5.3.1.1.
- The same new elements and *priceInfo* element are defined in the Offer Response Message, and descriptions of the ORM are added in Section 5.4.2.
- Relationship between MCMF and dealManifest is described in Section 5.4.2.2.
- Requirements for MC-ready disc are added in Section 5.6.
- Recommendations for Offer preparation are added in Section 5.8.
- Chapter 8, “Additional Requirements for the 3D Feature” added

1.6 Notation

Except where specifically noted otherwise, this document uses the same notations and conventions for numerical values, operations, and bit/byte ordering as described in the *Introduction and Common Cryptographic Elements* book of this specification.

1.7 Terminology

Aligned Unit: An Aligned Unit consists of a series of 32 Source Packets.

Block Key: A Block Key is a key to encrypt and decrypt each Aligned unit.

CPS Unit: A CPS Unit is a group of titles, to which the same title key has been assigned.

CPS Unit Key: A CPS Unit Key is a Blu-ray Disc synonym for the Title Key.

CPS Unit Usage file: A CPS Unit Usage file is a Blu-ray Disc synonym for the Title Usage file.

ECC Cluster: An ECC Cluster consists of a series of 32 Physical Sectors.

Hash Unit: A Hash Unit consists of a series of 96 Logical Sectors.

Hash Value: A Hash Value is data which has been calculated from a byte sequence in a Hash Unit.

Logical Sector: A Logical Sector is a data field in BD Pre-recorded Disc. All Logical Sectors in a BD Pre-recorded Disc shall have the same size.

Reserved: The term “Reserved”, when used to define the syntax of the data structure, indicates that the field may be used for future extensions. All the bits of a reserved field in the syntax of a data structure shall be set to 0₂. The term “Reserved”, when used to define the meaning of values, indicates that the reserved values may be used for future extensions. The reserved values shall never be used in this version.

Segment Key: A Segment Key is a Blu-ray Disc synonym for the Title Key for Sequence Key (SK) segment portion.

Source Packet: A Source Packet consists of a Source Packet header and a subsequent MPEG-2 transport packet.

1.8 Abbreviation and Acronyms

BD	Blu-ray Disc
BDMV	Blu-ray Disc Movie
BD-ROM	Blu-ray Disc Read-Only Media
CCI	Copy Control Information
CHT	Content Hash Table
CPS	Content Protection System
ECC	Error Correction Code
MPEG	Moving Picture Experts Group
RMF	ROM-Mark Flag
RMIVI	ROM_Mark_IV_Indicator
VFS	Virtual File System

1.9 About Blu-ray Disc Read-Only Media and ROM-Mark

Blu-ray Disc Read-Only Media has two types of physical media. In this document “BD9” and “BD25” are used to identify these two types of physical media with the following definition.

- BD9: Physical media based on ECMA-267 with capacity of 4.7 or 8.5 gigabytes.
- BD25: Physical media with capacity of 25.0 or 27.0 gigabytes in one Layer.

ROM-Mark is the method to record the Volume ID data for both BD9 and BD25.

Chapter 2

Details for Content Revocation

2. Introduction

Content revocation requires the Content Certificate that is specified in Chapter 2 of the *Pre-recorded Video Book* of this specification. This chapter describes additional details of content revocation that are specific to the BDMV format.

As described in the *Pre-recorded Video Book*, every hash unit of the AV content in the BDMV format on the disc is hashed, and this hashed value is included in the Content Hash Table. Every part of the Content Hash Table, that corresponds to an AV content file, is then hashed, and this hashed value is included in the unsigned Content Certificate as a Content Hash Table Digest. This unsigned Content Certificate is finally signed by the AACS LA, and this becomes the Content Certificate.

A disc may contain both encrypted content and unencrypted content. The Content Certificate, however, shall cover all the Clip AV stream files under “\BDMV\STREAM” directory on the disc, whether they are encrypted or not.

2.1 Content Certificate

In parallel with the “\BDMV” directory, a single Content Certificate shall be stored per physical layer in the “\AACS” directory and in the “\AACS\DUPLICATE” directory. The single-layer disc has a single file named “Content000.cer”, while the dual-layer disc has two files named “Content000.cer” for Layer 0 and “Content001.cer” for Layer 1. Note that the Content000.cer and the Content001.cer are stored on Layer 0 and Layer 1 respectively.

The data format of the Content Certificate is defined in Table 2-1.

Table 2-1 – Content Certificate for BD Pre-recorded Disc

Byte	Bit	7	6	5	4	3	2	1	0
0	Certificate Type: 00 ₁₆								
1	BEE	(reserved)							
2	Total_Number_of_HashUnits								
...									
5									
6	Total_Number_of_Layers								
7	Layer_Number								
8	Number_of_HashUnits								
...									
11									
12	Number_of_Digests								
13									
14	Applicant ID								
15									

16	(msb)	CCSS ID	(lsb)	Sequence Number 1
17	Sequence Number 1	(msb)		
18		Timestamp		
19	(lsb)	Sequence Number 2		
20		Minimum CRL Version		
21				
22		(reserved)		
23				
24		Length_Format_Specific_Section		
25				
26		Hash_Value_of_MC_Manifest_File		
:				
45				
46		Hash_Value_of_BDJ_Root_Cert		
:				
65				
66		Num_of_CPS_Unit		
67				
68		Hash_Value_of_CPS_Unit_Usage_File#1		
...				
87				
		...		
68+(J-1)*20		Hash_Value_of_CPS_Unit_Usage_File#J		
..				
87+(J-1)*20				
K (see note below)		Content Hash Table Digest #1		
:				
K+7				
		...		
...				
K + (N-1)*8		Content Hash Table Digest #N		
...				
K+7 + (N-1)*8				
K+8+(N-1)*8		Signature Data		
:				
K+47+(N-1)*8				

Note: $K = 88 + (J-1) * 20$

Details of each field are defined in the *Pre-recorded Video Book* of this specification with the following exceptions:

- A 1-bit Bus Encryption Enabled (BEE) flag, where 0₂ means that bus encryption is not enabled for the content covered by this Content Certificate, and 1₂ means that bus encryption is enabled for that content. Note that in the dual-layer case, both the BEE flag in “Content000.cer” and the BEE flag in “Content001.cer” shall be the same value.
- A 4-byte Total_Number_of_HashUnits field indicates the total number of Hash Units on the disc.
- A 1-byte Total_Number_of_Layers field indicates the total number of layers on the disc.
- A 1-byte Layer_Number field indicates the layer of the disc for which this Content Certificate is created. This field shall be 0 for “Content000.cer”, and 1 for “Content001.cer”.
- A 4-byte Number_of_HashUnits field indicates the number of Hash Units on the layer for which this Content Certificate is created.
- A 2-byte Number_of_Digests field indicates the number of Clip AV stream files that have a file size equal to or more than 96 Logical Sectors on the layer for which this Content Certificate is created.
- A 2-byte Applicant ID assigned by AACS LA.
- A 4-byte Content Sequence Number consists of 6-bit Content Certificate Signing Server ID (CCSS ID), 15-bit Timestamp, and 11-bit Sequence Number that is a concatenation of a 4-bit Sequence Number 1 and 7-bit Sequence Number 2, and is assigned by AACS LA to uniquely identify the Certified Content amongst that Content Provider’s content. The combination of the Applicant ID and the Content Sequence Number is referred to as the *Content Certificate ID*. In other words, the Content Certificate ID is a 6-byte number. Timestamp indicates the date (referenced to UTC) when a Content Certificate is signed, and contains a value for the elapsed days from 1st January 2008 with the value 0 representing 1st January 2008. Timestamp values predating 2 February 2008 are reserved, and shall not be used as a timestamp.
- A 2-byte Minimum CRL Version value, assigned by the AACS LA to indicate the minimum Content Revocation List Version number that shall accompany the Certified Content.
- A 2-byte Length_Format_Specific_Section that specifies the length of the subsequent Format_Specific_Section. The Format Specific Section for BD includes the subsequent Hash_Value_of_MC_Manifest_File, Hash_Value_of_BDJ_Root_Cert, Num_of_CPS_Unit, and a sequence of Hash_Value_of_CPS_Unit_Usage_Files.
- A 20-byte Hash_Value_of_MC_Manifest_File contains the hash value for the Managed Copy Manifest File as defined in Section 5.3.
- A 20-byte Hash_Value_of_BDJ_Root_Cert contains the hash value for the BD-J Root Certificate as defined in Section 2.3.2.4.
- A 2-byte Num_of_CPS_Unit fields indicates the number of CPS Units on the disc.
- A series of 20-byte Hash_Value_of_CPS_Unit_Usage_Files contains the hash value for the CPS Unit Usage File as defined in Section 2.3.2.2.

2.2 Content Revocation List

In parallel with the “\BDMV” directory, the Content Revocation List (CRL) “ContentRevocation.lst” shall be stored in the “\AACS” directory and in the “\AACS\DUPLICATE” directory.

The data format for the Content Revocation List is defined in Table 2-2 of the *Pre-recorded Video Book* of this specification. Note that in the dual-layer case, the Licensed Player shall check at least one Certificate ID and if the ID is revoked, the access to any layer of such a disc shall be aborted.

CRL data shall be recorded from the first byte of the file, and the null (00₁₆) padding may be attached after the CRL data in the file for authoring and mastering purposes.

2.3 Content Hash Table

2.3.1 Data Structure for Content Hash Table

For each physical layer of BD-ROM, the Content Hash Table (CHT) shall be stored in the “\AACS” directory and in the “\AACS\DUPLICATE” directory. The single-layer disc has a single file named “ContentHash000.tbl”, while the dual-layer disc has two files named “ContentHash000.tbl” for Layer 0 and “ContentHash001.tbl” for Layer 1. Note that the ContentHash000.tbl and the ContentHash001.tbl are stored on Layer 0 and Layer 1 respectively. A Licensed Player shall verify the CHTs regardless of their physical location.

The Content Hash Table shall contain an 8-byte Hash Value for each hash unit of the Clip AV stream files under “\BDMV\STREAM” directory in the corresponding layer. Seven or more hash units of Clip AV stream files shall be recorded on the BD-ROM. In other words, the total size of Clip AV stream files excluding tail portions under “\BDMV\STREAM” directory shall be more than or equal to 1344KB. Details of the hash calculations are defined in Section 2.3.2 of this specification. Each Clip AV stream file is sequentially divided into hash units from head to tail, and the size of each hash unit is 96 Logical Sectors. Note that the tail portion of each Clip AV stream file, whose size is less than 96 Logical Sectors, is omitted from storing of its Hash Value. If the file size of Clip AV stream file is exactly the multiple of 96 Logical Sectors, there is no tail portion to be omitted from storing. If a Clip AV stream is divided in two and recorded on both layers, then the extents size of each Clip AV stream file on Layer 0 shall be exactly the multiple of 96 Logical Sectors, and the extents of each Clip AV stream file on Layer 1 shall be logically recorded after the extents of the corresponding Clip AV stream on Layer 0. Note that the size of CHT is zero bytes if there is no Clip AV stream that has a file greater than or equal to 96 Logical Sectors on the corresponding layer.

Table 2-2 shows the data structure for Content Hash Table.

Table 2-2 Syntax for Content Hash Table

Syntax	No. of bits	Mnemonics
Content Hash Table {		
for(I=0 ; I < Number_of_Digests ; I++) {		
Starting_HU_Num#I	32	uimsbf
Clip_Num#I	32	uimsbf
HU_Offset_in_Clip#I	32	uimsbf
}		
for(I=0 ; I < Number_of_HashUnits ; I++){		
Hash_Value#I	64	bslbf
}		
}		

Starting_HU_Num#I (4 bytes) indicates the position in hash units of the first Hash Value of Clip AV stream file #I that have a file size greater than or equal to 96 Logical Sectors in the Hash Value part in this table. This number starts from zero.

(Note) In case of dual-layer disc, the Starting_HU_Num#0 in the ContentHash001.tbl is equal to the Number_of_HashUnits on Layer 0. Refer to the example in Figure 2-2.

Clip_Num#I (4 bytes) indicates a 5-digit number included in the file name of Clip AV stream file #I that has a file size greater than or equal to 96 Logical Sectors. This value is stored in the ascending order of the 5-digit number included in the file name of the corresponding Clip AV stream file.

HU_Offset_in_Clip#I (4 bytes) indicates the offset in hash units from the top of the Clip AV stream file #I that has a file size greater than or equal to 96 Logical Sectors. This offset starts from zero. The Hash Value at the Starting_HU_Num#I corresponds to the AV data at this offset in the Clip AV stream file #I.

Hash_Value#I (8 bytes) contains the Hash Value calculated from the hash unit #I in the layer corresponding to this Content Hash Table. These Hash_Value#I shall be listed in the ascending order of the 5-digit number included in the file name of the corresponding Clip AV stream file, and in the ascending order of the logical position in the Clip AV stream file.

Number_of_Digests is defined in Table 2-1, and indicates the number of Clip AV stream files in the layer corresponding to this Content Hash Table.

Number_of_HashUnits is defined in Table 2-1, and indicates the number of hash units in the layer corresponding to this Content Hash Table.

Content Hash Table Digest #J defined in Table 2-1 is the digest of the concatenation of the Hash Values from the Starting_HU_Num#I to Starting_HU_Num#(I+1) – 1.

Figure 2-1 shows an example of the relationship between the Content Hash Table Digest and the Hash Value.

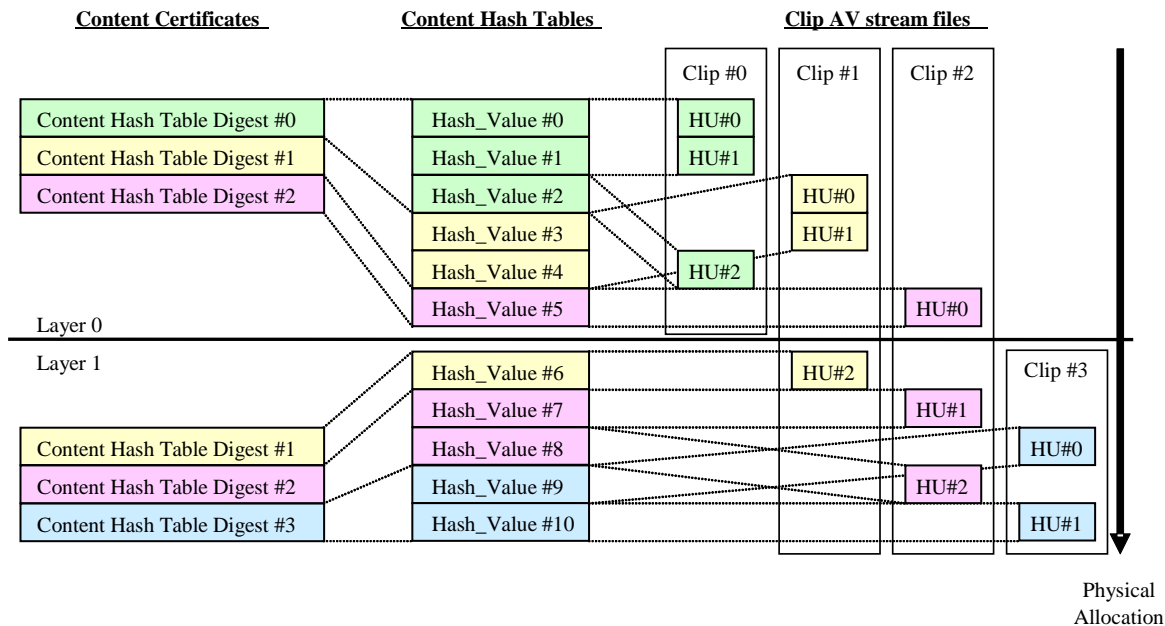


Figure 2-1 Example of the relationship between the Content Hash Table Digest and the Hash Value

In this example, there is one Content Certificate for each layer, one Content Hash Table for each layer, and four Clip AV stream files that have a file size greater than or equal to 96 Logical Sectors. The whole part of Clip AV stream file #0 is recorded on Layer 0, and the whole part of Clip AV stream file #3 is recorded on Layer 1. Clip AV stream file #1 and #2 are recorded separately on both Layer 0 and Layer 1. From a physical allocation

point of view, each Clip AV stream file is fragmented and the file extents of different Clip AV stream files are recorded alternately.

In this example, the Content Hash Table for Layer 0 includes Hash_Values for Hash Units of Clip AV stream file #0, #1 and #2. The Content Hash Table for Layer 1 includes Hash_Values for Hash Units of Clip AV stream file #1, #2 and #3. Note that Hash_Values for Hash Unit #0 and #1 for Clip AV stream file #1 and Hash Unit #0 for Clip AV stream file #2 are included only in the Content Hash Table for Layer 0.

To calculate the Content Hash Table Digest of each layer, only the Hash_Values in the same layer are used. For example, to calculate the Content Hash Table Digest #1 for Layer 0 in Figure 2-1, Hash_Value #3 and #4 in the Content Hash Table for Layer 0 are used. Hash_Value #0 in the Content Hash Table for Layer 1 is not used.

Figure 2-2 shows an example of the Content Hash Table syntax defined in Table 2-2.

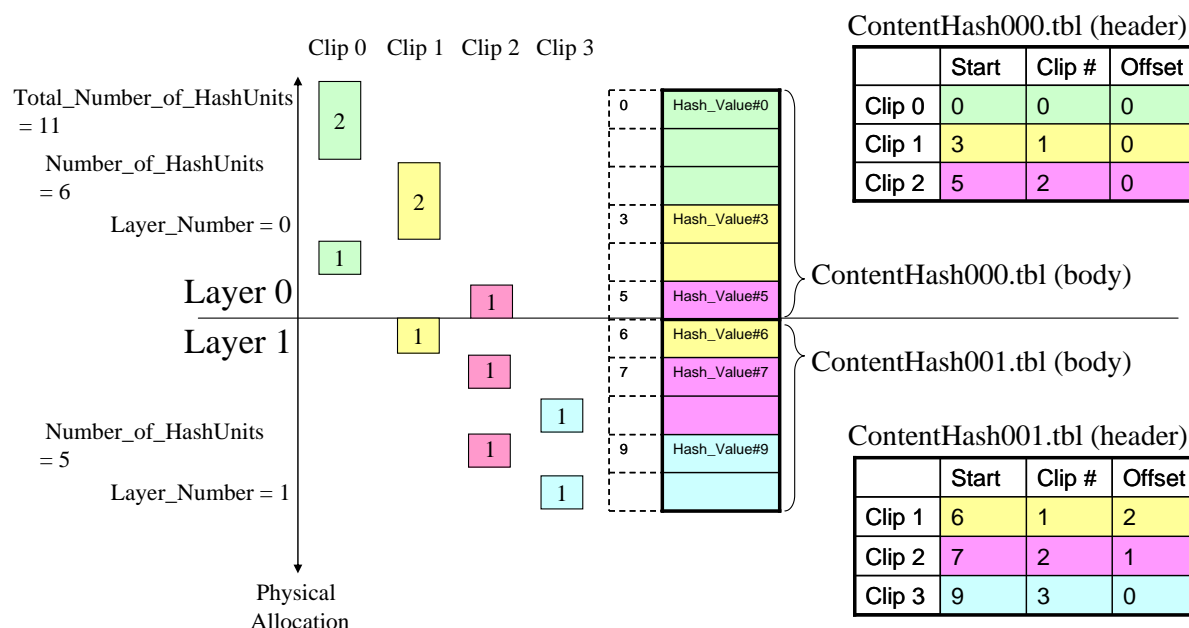


Figure 2-2 Example of the Content Hash Table syntax

2.3.2 Hash Calculation

2.3.2.1 Clip AV stream

A Hash Value for each Hash Unit of the Clip AV stream file is calculated using the SHA-1 hashing function as defined in the equation below. If the data is encrypted, the encrypted data itself is used as the input to the hashing function, so that the Licensed Player need not decrypt the data before calculating a Hash Value. The stored Hash Value is the least significant 64 bits of the result for the SHA-1 hashing function.

$$\text{Hash_Value} = [\text{SHA-1}(\text{Hash_Unit})]_{\text{lsb}_{64}}$$

Where SHA-1 is the SHA hashing function as defined in *Introduction and Common Cryptographic Elements* book of this specification.

2.3.2.2 Usage Rule

A hash value for each CPS Unit Usage File is also calculated using the SHA-1 hashing function as defined in the equation below.

$$\text{Hash_Value_of_CPU_Unit_Usage_File} = \text{SHA-1}(\text{CPS Unit Usage File})$$

Hash_Value_of_CPU_Unit_Usage_File is used to verify the integrity of the CPS Unit Usage File.

2.3.2.3 Managed Copy Manifest File

A hash value for the Managed Copy Manifest File is also calculated using the SHA-1 hashing function as defined in the equation below.

$$\text{Hash_Value_of_MC_Manifest_File} = \text{SHA-1}(\text{Managed Copy Manifest File})$$

Hash_Value_of_MC_Manifest_File is used to verify the integrity of the Managed Copy Manifest File. If the Managed Copy Manifest File is not recorded on the BD-ROM, Hash_Value_of_MC_Manifest_File shall be set to all zero.

2.3.2.4 BD-J Root Certificate

A hash value for the BD-J Root Certificate (\\CERTIFICATE\\app.discroot.crt) for application authentication is also calculated using the SHA-1 hashing function as defined in the equation below.

$$\text{Hash_Value_of_BDJ_Root_Cert} = \text{SHA-1}(\text{BD-J Root Certificate})$$

Application Authentication Data is used to verify the integrity of the Application. For the application authentication, refer to the *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*. Hash_Value_of_BDJ_Root_Cert is stored in the Content Certificate as defined in Table 2-1.

If the BD-J Root Certificate is not recorded on the BD-ROM, Hash_Value_of_BDJ_Root_Cert shall be set to all zero.

2.3.3 Verifying Content Certificate

A Licensed Product which plays back a BDMV shall verify the Content Certificate as defined in Section 2.6 of the *Pre-recorded Video Book* of this specification. This subsection provides additional details for the BDMV format.

2.3.3.1 Clip AV stream

If the Licensed Product selects type a) as defined in procedure 1 of Section 2.6 of the *Pre-recorded Video Book* of this specification, seven Hash Units shall be randomly selected from all the Hash Units recorded on the BD-ROM.

If the License Product selects type b) as defined in procedure 1 of Section 2.6 of the *Pre-recorded Video Book* of this specification, the first Hash Unit which is read from the BD-ROM for each Title, shall be verified. During the playback of each Title, at least 1% of the Hash Units recorded on the BD-ROM shall be randomly selected and verified.

As an authoring guideline, it is strongly recommended to prepare at least a 3-second non-media-access segment within the first 300 seconds of title play back. A non-media-access segment is a segment where a Licensed Player does not need to access any data on the media. Still picture presentation with pause is one example of a non-media-access segment.

2.3.3.2 Usage Rule

Licensed Products shall verify Hash_Value_of_CPS_Unit_Usage_File for a CPS Unit to be played back.

2.3.3.3 Managed Copy Manifest File

If a Licensed Product uses (reads) the Managed Copy Manifest File for the purpose of Managed Copy, it shall verify Hash_Value_of_MC_Manifest_File for a BD-ROM with the Managed Copy Manifest File.

2.3.3.4 BD-J Root Certificate

The Licensed Product shall verify Hash_Value_of_BDJ_Root_Cert for a BD-ROM with a BD-J Root Certificate.

Control Data Zone is divided into six areas: BD9 System Data1 (16ECC Clusters), Partial MKB1 (40ECC Clusters), Partial MKB2 (40ECC Clusters), Partial MKB3 (40ECC Clusters), Partial MKB4 (40ECC Clusters), and BD9 System Data2 (16ECC Clusters). BD9 System Data1 and BD9 System Data2 shall have the same data to duplicate the content of BD9 System Data. Partial MKB1, Partial MKB2, Partial MKB3, and Partial MKB4 shall have the same data to record Partial Media Key Block 4 times.

As defined in the ECMA 267 format specification, “Physical format information” and “Disc manufacturing information” are recorded respectively in the first sector and the second sector of all ECC Clusters in the BD9 Control Data Zone.

Both BD9 System Data1 and BD9 System Data2 consist of 16 ECC Clusters. The first ECC Cluster of both BD9 System Data1 and BD9 System Data2 has CPS_Sector at its third sector, and other sectors in this ECC Cluster are reserved. The second ECC Cluster to the last ECC Cluster of both BD9 System Data1 and BD9 System Data2 are reserved for future use, and has non-specified 14 sectors in each ECC Cluster. The content of CPS_Sector is defined in Section 3.3.1.

The data structure of Partial MKB1, Partial MKB2, Partial MKB3, and Partial MKB4 is defined in Section 3.4.2.

3.3 Volume Identifier

For the purpose of encryption and decryption of the Content, the Volume Identifier (ID_v) is combined with the Media Key (K_m) to produce the Volume Unique Key (K_{vu}) as follows:

$$K_{vu} = \text{AES-G}(K_m, ID_v)$$

The Volume Identifier shall be stored in a manner that cannot be duplicated by consumer recorders. For BD-ROM, the Volume Identifier shall be stored in the ROM-Mark of the BD-ROM disc. For the details of the ROM-Mark, refer to *ROM-Mark Outline*.

Table 3-1 shows the data format for the Volume Identifier that is stored in the payload of the ROM-Mark.

Table 3-1 Data Format for Volume Identifier

Byte	Bit	7	6	5	4	3	2	1	0
0		<div style="display: flex; justify-content: space-between;"> (msb) Volume Identifier (lsb) </div>							
:									
15									

3.3.1 CPS_Sector

For BD25 Media, the last sector in the first Physical Cluster of each Info Fragment in the PIC zone (Permanent Information & Control Data zone) is reserved as a CPS_Sector.

The other sectors in the first Physical Cluster of each Info Fragment are reserved for storing Disc Information and other information. For the details of the PIC zone, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 1: Basic Format Specifications*.

For BD9 Media, the first ECC Cluster in the Control Data Zone in the Lead-In area is used to record CPS_Sector. The data structure of CPS_Sector is the same as the BD25 case. The data structure in BD9 Control Data Zone is defined in Section 3.2.

The ROM-Mark Flag (RMF) and the ROM_Mark_IV_Indicator (RMIVI) are stored in the top of the CPS_Sector. Table 3-2 shows the data format for CPS_Sector.

Table 3-2 Data Format for CPS_Sector

Bit	7	6	5	4	3	2	1	0
Byte								
0	RMF	RMIVI			(reserved)			
1	(reserved)							
:								
2047								

The ROM-Mark Flag indicates whether a ROM-Mark is stored on the disc or not. Table 3-3 defines the meaning of ROM-Mark Flag.

Table 3-3 ROM-Mark Flag

ROM-Mark Flag	Meaning
0 ₂	No ROM-Mark is stored on the disc
1 ₂	A ROM-Mark is stored on the disc

The ROM_Mark_IV_Indicator indicates which value of ROM_Mark_IV is used for the ROM-Mark detection. Table 3-4 defines the value and meaning of this field. This field shall be set to 000₂.

Table 3-4 ROM_Mark_IV_Indicator

ROM_Mark_IV_Indicator	Meaning
000 ₂	The ROM-Mark detector IV values shall be used as ROM_Mark_IV
001 ₂ - 101 ₂	Reserved for BD-CPS
Other	Reserved

3.4 Partial Media Key Block for Host Revocation List

The Host Revocation List is stored as “Partial Media Key Block” in the Lead-In area of disc. Partial Media Key Block consists of “Type and Version Record” and “Host Revocation List Record”.

This section defines the structure of the Partial Media Key Block and other requirements for the Partial Media Key Block for recording on BD-ROM Media.

Table 3-5 shows the data format for the Partial Media Key Block.

The Partial Media Key Block shall be stored as 64KB units with zero padding.

(Note 1) The maximum size of the reserved area for the Partial Media Key Block on BD-ROM Media is one megabyte.

Table 3-5 Partial Media Key Block Format

Bit Byte	7	6	5	4	3	2	1	0
0	Type and Version Record							
...								
11								
12	Host Revocation List Record							
13								
14								
...								
X								

A Licensed Drive with BD-ROM reading function is required to store the Partial Media Key Block in its non-volatile memory. The Host Revocation List Record is required to be stored in the non-volatile memory of the Licensed Drive and consists of the data being signed for the first signature block including the Signature for Block 1. The details of the Type and Version Record and the Host Revocation List Record are defined in Section 3.2.5 of the *Introduction and Common Cryptographic Elements* book of this specification.

(Note 2) For the BD Prerecorded Disc, the Licensed Drive shall handle the disc as AACS compliant media, if the Partial Media Key Block is recorded on the BD-ROM.

The behavior for a Licensed Drive is as follows:

- In the case that the Licensed Drive cannot verify and read the Partial Media Key Block on the media for some reason, the Licensed Drive shall read the Partial Media Key Block stored in non-volatile memory of the Licensed Drive and use it for the authentication process.

3.4.1 Partial Media Key Block for Host Revocation List for BD25 Media

For BD25 Media, the Partial Media Key Block shall be stored in the PIC zone in Inner Zone 0 of the BD-ROM disc. Note that the PIC zone (Permanent Information & Control Data Zone) shall consist of 5 repetitions of a PIC Info Fragment. The Partial Media Key Block shall be written 5 times and shall begin from Cluster 1, i.e. AUN 00B9220₁₆, 00BFC20₁₆, 00C6620₁₆, 00CD020₁₆, 00D3A20₁₆. In the case of a multiple-layer disc, each PIC zone shall have Partial Media Key Blocks stored in the same way as they would be with a single layer. The details of the PIC are described in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 1: Basic Format Specifications*.

3.4.2 Partial Media Key Block for Host Revocation List for BD9 Media

For BD9 Media, the Partial Media Key Block shall be stored in the Control Data Zone of the BD9 Media Lead-In area.

Figure 3-2 depicts the structure of the BD9 Lead-In area and the recording method of the Partial Media Key Block. The Partial Media Key Block shall be written 4 times in Partial MKB1~ Partial MKB4 area respectively. Partial MKB1~ Partial MKB4 area begin at ECC Cluster number 17, 57, 97, 137. Each ECC Cluster has 14 sectors that shall be used to store the Partial Media Key Block information. All unused sectors shall be filled with 00₁₆.

The details of the Lead-In area of BD9 Media are described in *ECMA-267 Format*.

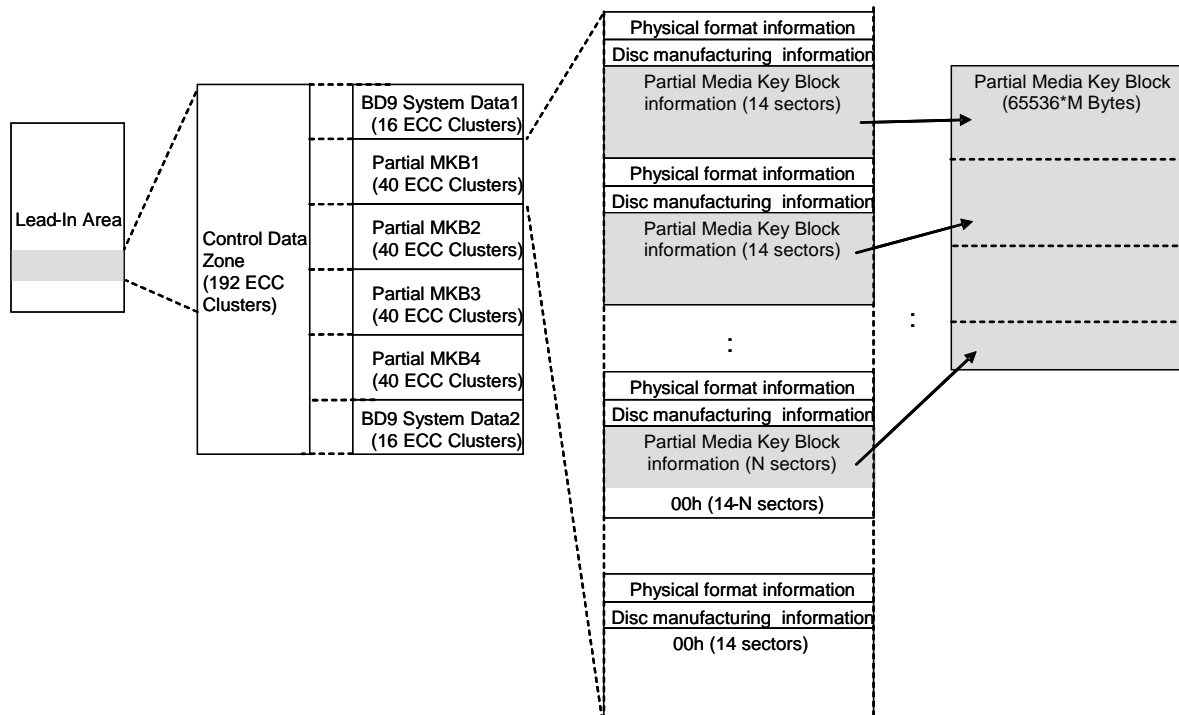


Figure 3-2 Partial Media Key Block recording in AACS-protected BD9 Media

3.5 CPR_MAI in Content Provider Information Sectors of BD9 Media

Table 3-6 describes the data format of CPR_MAI (6 bytes) in the Content Provider Information of BD9 Media. CPR_MAI_Byte1 (=10₁₆) indicates that the media is AACS-protected BD9 Media.

Table 3-6 Data Format for CPR_MAI in Content Provider Information of BD9 Media

Byte	Bit	7	6	5	4	3	2	1	0
0		CPR_MAI_Byte1 = 10 ₁₆							
1		CPR_MAI_Byte2 = 00 ₁₆							
2		(reserved)							
:									
5									

3.6 Pre-recorded Media Serial Number

For the purpose of using On-line Connections, the Pre-recorded Media Serial Number is defined and is used for generating a MAC. In a PC-based system, this Pre-recorded Media Serial Number shall be retrieved from the disc using the procedure defined in Section 4.5 of the *Introduction and Common Cryptographic Elements* book of this specification. The Pre-recorded Media Serial Number is optional for BD-ROM discs. For BD-ROM, the Pre-recorded Media Serial Number shall be stored in the BCA record of the BD-ROM disc.

A Licensed Player shall use the 128-bit value found in the BCA Data Unit whose first 8 bits are set to 00000100₂ as the Pre-recorded Media Serial Number as defined in Table 3-7 below.

Table 3-7 shows the data format for the Pre-recorded Media Serial Number that is stored in BCA.

Table 3-7 Data Format for BCA Record for Pre-recorded Media Serial Number

Byte	Bit	7	6	5	4	3	2	1	0
0		Application Identifier = 000001 ₂						Data Unit sequence number = 00 ₂	
1		(msb) <div>Applicant ID</div> (lsb)							
2									
3		(msb) <div>Unique Value</div> (lsb)							
:									
15									

A Licensed Player shall use the full Data Unit, from the Application Identifier to the Unique Value, as the 128-bit Pre-recorded Media Serial Number.

Application Identifier field (6 bits) indicates the application identifier, and shall be set to 000001₂.

The Data Unit sequence number field (2 bits) indicates the Data Unit sequence number, and shall be set to 00_2 for the Pre-recorded Media Serial Number.

The Applicant ID field (16 bits) shall contain the applicant identifier assigned to each replicator by the AACSLA.

The Unique Value field (104 bits) shall be assigned a unique value for each disc by each replicator.

In the case that an un-guessable PMSN is used with the default AACSLA Managed Copy Server as defined in Chapter 5 of the *Pre-recorded Video Book* of this specification, the Unique Value field shall be of the following form described in Table 3-8.

Table 3-8 Data Format for Unique Value in the case of an un-guessable PMSN

Byte	Bit	7	6	5	4	3	2	1	0
0	(msb)	Applicant-defined Value (lsb)							
1									
2	(msb)	Check bits (lsb)							
:									
8									
9	(msb)	Counter (lsb)							
:									
12									

Applicant-defined Value (16 bits) is free for use by the replicator. For example, it can be used to assign a unique identifier to each replication facility within the Applicant to guarantee that the PMSN is globally unique.

Check bits (56 bits) is the most significant 56 bits of the encrypted value of Counter and the fixed value as defined in Chapter 5 of the *Pre-recorded Video Book* of this specification, where $Y = 56$.

Counter contains a value as defined in Chapter 5 of the *Pre-recorded Video Book* of this specification.

3.7 Bus Encryption Flag

The Bus Encryption Flag (BEF) is used to indicate whether the sector data shall be encrypted or not in the interface bus between the Licensed Drive and the PC Host. If the BEF is set to 1_2 , the corresponding sector data shall be encrypted in the interface bus in the manner that is specified in Section 3.7.1. Otherwise, the Licensed Drive shall not encrypt sector data across the interface bus.

If the Bus Encryption Enabled (BEE) flag in the Content Certificate is set to 1_2 , the BEF shall be set to 1_2 for all the sectors that correspond to the Aligned Unit with Copy_permission_indicator set to 11_2 of the Clip AV stream files under “\BDMV\STREAM” directory. Otherwise, the BEF shall be set to 0_2 . Note that the BEF

shall be set to 0₂ for the sectors that do not correspond to Clip AV stream files under “\BDMV\STREAM” directory. For the details of Copy_permission_indicator, refer to Section 3.10.2.

(Note) If an application handles Clip AV stream file (e.g. BD-J Application copies Clip AV stream file on BD-ROM Disc to the Local Storage), such stream shall be handled by the application without bus-encrypted form. In other words, PC Host shall decrypt bus-encrypted Clip AV stream file and hand it over to the application. For the Local Storage, refer to Chapter 4 of this book.

For BD25 Media, the Bus Encryption Flag shall be stored in the User Control Data associated with the corresponding sector.

Table 3-9 shows the data format for the Bus Encryption Flag (1 bit) which is recorded in User Control Data of BD-ROM disc.

Table 3-9 Data Format for Bus Encryption Flag in User Control Data

Byte	Bit	7	6	5	4	3	2	1	0
0	BEF	(reserved)							
1	(reserved)	(reserved)							
2									
:									
17									

For BD9 Media, the Bus Encryption Flag shall be stored in CPR_MAI field of sector header associated with the corresponding sector.

Table 3-10 shows the data format for the Bus Encryption Flag (1 bit) which is recorded in CPR_MAI in Data Area.

Table 3-10 Data Format for Bus Encryption Flag in Sector Header

Byte	Bit	7	6	5	4	3	2	1	0
0	BEF	(reserved)							
1	(reserved)	(reserved)							
2									
:									
5									

3.7.1 Encryption Scheme

When the BEF is set to 1₂, bus encryption is applied to the associated sector.

The 2032 bytes after the first 16 bytes of each sector are encrypted using the Data Key and AES-128CBCE. A new CBC cipher chain is started for each Sector (see Figure 3-3).



Figure 3-3 CBC chaining on “sector” basis

The Initialization Vector of CBC Mode used in this scheme is described in Section 2.1.2 of *Introduction and Common Cryptographic Elements* book of this specification.

(Note) Other adaptation books of this specification may define a flag, like the BEF in this book, and also encryption scheme for the bus encryption. However, if the Licensed Drive is not designed to be compliant to such books, the Drive is not required to recognize the flag defined in such books, nor to encrypt the sector data associated with the flag.

3.8 Key Conversion Data

Note that for certain classes of Licensed Players, processing of the Media Key Block results in a *Media Key Precursor* K_{mp} instead of a Media Key. These classes of Licensed Players are defined in the AACS license. After they calculate the Media Key Precursor, they shall combine it with *Key Conversion Data* (KCD), to obtain the actual Media Key.

For certain classes of Licensed Players, the Key Conversion Data (KCD) is combined with the Media Key Precursor (K_{mp}) to produce the Media Key (K_m) as follows:

$$K_m = \text{AES-G}(K_{mp}, \text{KCD})$$

The Key Conversion Data shall be stored in a manner that cannot be read by an open platform Licensed Drive. For BD-ROM, the Key Conversion Data shall be stored in the KCD-Mark of the BD-ROM disc. For the details of the KCD-Mark, refer to *KCD-Mark Outline*.

Table 3-11 shows the data format for the Key Conversion Data that is stored in the payload of the KCD-Mark.

Table 3-11 Data Format for Key Conversion Data

Byte	Bit	7	6	5	4	3	2	1	0
0	Key Conversion Data								
:									
15									

3.9 CPS Unit Key File and CPS Usage File

3.9.1 Application Format Structure

Figure 3-4 describes a simplified diagram of the BD-ROM application format.

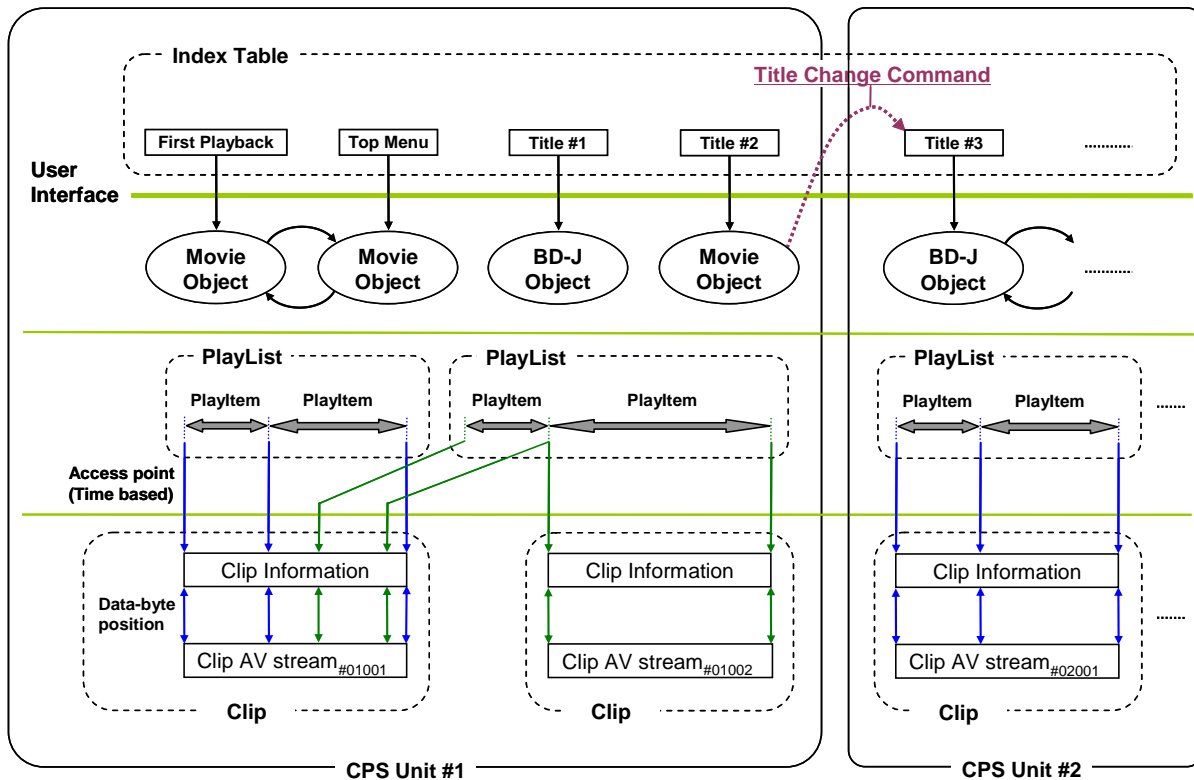


Figure 3-4 Application Format Structure and CPS Unit

This application format has four layers for managing AV stream files: those are Index Table, Movie Object, PlayList and Clip.

3.9.1.1 Clip

Each pair of an AV stream file and its attribute is considered to be one object. A Clip is an object consisting of a Clip AV stream file and its corresponding Clip information file. A Clip AV stream file stores data, which is basically an MPEG-2 transport stream defined in a structure conforming to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*. The Clip Information file stores the time stamps of the access point into the corresponding AV stream file. The Player reads the Clip Information to find out the position where it begins to read the data from the AV stream file.

3.9.1.2 PlayList

A PlayList is a collection of playing intervals in the Clips. One such playing interval is called a PlayItem and consists of a pair of pointers called: IN-point and OUT-point. This pair points to positions on a time axis of the Clip. Therefore, a PlayList is a collection of PlayItems. Here the IN-point means a start point of a playing interval, and the OUT-point means an end point of the playing interval.

3.9.1.3 Movie Object

A Movie Object consists of an executable navigation command program. This enables “dynamic scenario description”. Movie Objects are a layer above PlayLists. A navigation command in a Movie Object can launch a PlayList playback or a Movie Object can call another Movie Object so that a set of Movie Objects can manage playback of PlayLists in accordance with user’s interaction and preferences.

3.9.1.4 BD-J Object

A BD-J Object consists of a table of BD-J Applications and indicates a set of BD-J Applications. This also enables dynamic scenario description and interactive content playback by use of the Java programming environment. BD-J Objects are at the same layer of Movie Object, and selected per title basis. BD-J Applications in BD-J Object provides on-line functionality not only for the corresponding Title but also for the whole BD-ROM disc.

3.9.1.5 Index Table

Index Table is top-level information of the application format. This table contains entry points for all Titles, First Playback, and Top Menu. The Player references this table whenever a Title, First Playback, or Menu executing operation needs to be performed.

3.9.1.6 First Playback

First Playback is optionally defined in the Index Table and points to a Movie Object or a BD-J Object, which is played automatically when the disc is loaded. When the disc is loaded, the player refers to the entry of “First Playback” and obtains the corresponding Movie Object or BD-J Object. First Playback Movie Object / BD-J Object is an optional function. A disc may or may not contain First Playback Movie Object / BD-J Object.

3.9.1.7 Top Menu

Top Menu is optionally defined in the Index Table and points to a Movie Object or a BD-J Object. This is called by a user operation such as a “MenuCall”. A Movie Object indexed by Top Menu executes a PlayList whose PlayItem links a Clip having Button Objects. Each Button Object branches off to another Movie Object as a child Menu. Top Menu Movie Object is an optional function. A disc may or may not contain Top Menu Movie Object.

3.9.1.8 Title

Title is a logical unit for the user to recognize one playback group. The group may be one linear playback block or it may be a non-linear playback block with branching points. Each Title has a title_number. title_number

values are defined in ascending order, starting from one. All the values of title_number, no more than the total number of titles, shall be defined at least once on a disc.

3.9.2 CPS Unit

A CPS Unit is a group of a First Playback, a Top Menu, and/or Titles, which are encrypted by using the same Unit Key (K_{cu}). Each CPS Unit has its corresponding CPS Unit Usage file. Each CPS Unit has a CPS_Unit_number. CPS_Unit_number values are defined in ascending order, starting from one. So, the maximum value of CPS_Unit_number shall be the same as the number of CPS Units that are assigned to First Playback, Top Menu, and/or Titles. And all CPS_Unit_number from one up to the maximum CPS_Unit_number shall be used at least once.

All AV stream files that are referred to by First Playback are included in the same CPS Unit. All AV stream files that are referred to by Top Menu are included in the same CPS Unit. All AV stream files that are referred to by one Title are included in the same CPS Unit. If First Playback, Top Menu and/or a Title share one or more Clips, they shall be included in the same CPS Unit, i.e. the same Unit Key shall be assigned to First Playback, Top Menu and/or the Title. If multiple Titles share one or more Clips, these Titles shall be included in the same CPS Unit, i.e. the same Unit Key shall be assigned to these Titles. First Playback may or may not be included in the same CPS Unit with Top Menu, a Title, and/or Titles. Top Menu may or may not be included in the same CPS Unit with one or more Titles.

For example in Figure 3-4, since a First Playback, a Top Menu, and two Titles commonly refer to the same Clip AV stream_{#01001}, they belong to the same CPS Unit #1. Both Clip AV stream_{#01001} and Clip AV stream_{#01002} shall be encrypted by using the same key K_{cu1} .

To achieve higher security and future flexibility, different keys shall be assigned to different CPS Units. For example, Figure 3-4 shows different keys, K_{cu1} and K_{cu2} , that are assigned to CPS Unit #1 and CPS Unit #2. In this case, the switching between different CPS Units can be executed by some commands for Title change (e.g. Jump Title, Call Title, etc.) defined in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*.

Figure 3-5 and Figure 3-6 show the directory structure of the BD-ROM application format. Detailed information is described in the chapter “Directories and Files” in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*.

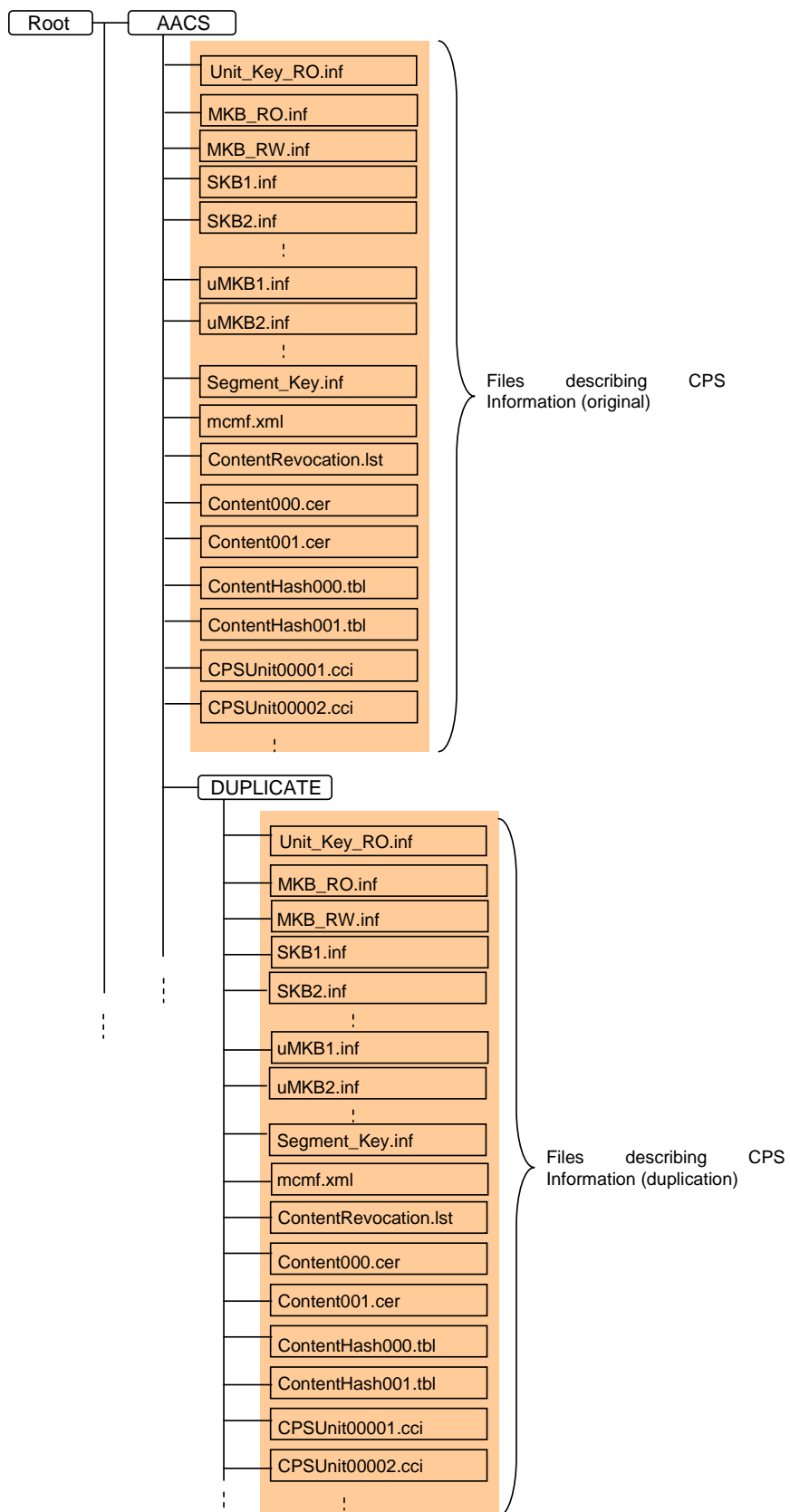


Figure 3-5 Directory structure for AACS directory

DUPLICATE directory contains the duplication of CPS information files and is used when these files in \AACS directory cannot be read. File name and the file data of the duplicated CPS files shall be the same as original CPS files. The location of the file data of duplicated CPS files should be physically far from the location of the file data of original CPS files.

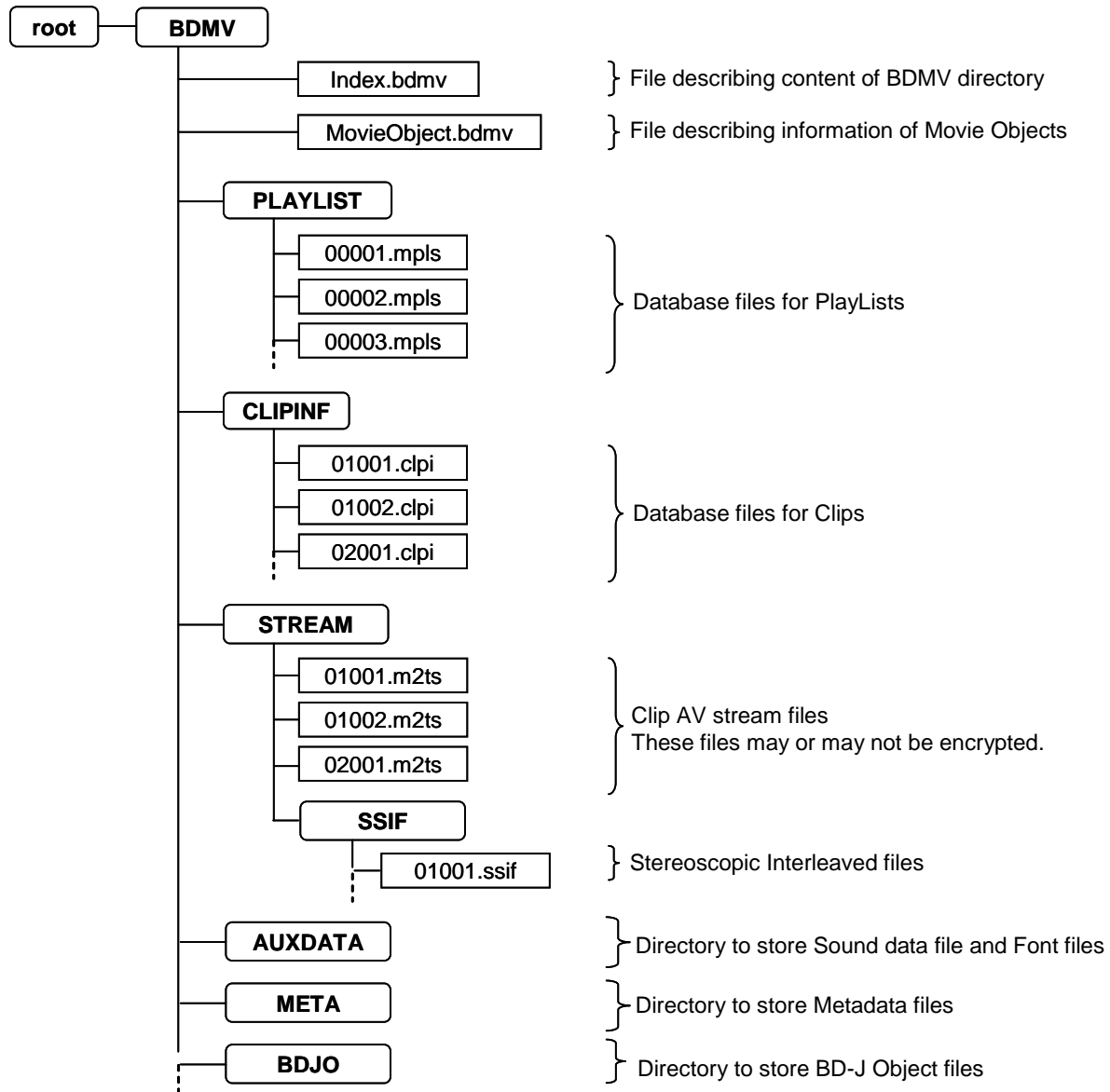


Figure 3-6 Directory structure for BDMV directory

Clip AV stream files under “\BDMV\STREAM” directory may be encrypted as described in Section 3.10.1. No other files under “\AACS” directory or “\BDMV” directory shall be encrypted using the scheme described in Section 3.10.1.

3.9.3 CPS Unit Key File (Unit_Key_RO.inf)

Each CPS Unit on the BD-ROM disc has a unique CPS Unit Key. All CPS Unit Keys on one disc shall be stored in the CPS Unit Key File “Unit_Key_RO.inf” in the “\AACS” directory and in the “\AACS\DUPLICATE” directory.

The following requirement is applied to the CPS Unit Key File to reserve enough size of continuous area for the CPS Unit Key File.

- The size of CPS Unit Key File shall be multiple of 65536 bytes.

Table 3-12 shows the data structure for CPS Unit Key File.

Table 3-12 Data Format of CPS Unit Key File for BDMV Application

Syntax	No. of bits	Mnemonic
CPS Unit Key File {		
Unit_Key_Block_start_address	32	Uimbsf
Reserved for future use	96	Bslbf
Unit_Key_File_Header()		
For (I=0 ; I<X ; I++){	(*1)	
padding word	16	Bslbf
}		
Unit_Key_Block()		
For (J=0 ; J<Y ; J++){	(*2)	
padding word	16	Bslbf
}		
}		

(*1) X (size of padding word) shall be such a value less than 8 that Unit_Key_Block() begins at 16-byte boundary.

(*2) Y (size of padding word) shall be such a value less than 32768 that the size of CPS Unit Key File becomes multiple of 65536 bytes.

Unit_Key_Block_start_address field (32 bits) indicates the start address of Unit_Key_Block() in the relative byte number from the first byte of CPS Unit Key File. The value of Unit_Key_Block_start_address field shall be a multiple of 16.

Table 3-13 shows the data structure for Unit_Key_File_Header() of CPS Unit Key File.

Table 3-13 Data Format of Unit_Key_File_Header() for BDMV Application

Syntax	No. of bits	Mnemonic
Unit_Key_File_Header(){		
Application_Type (= 01 ₁₆)	8	Uimsbf
Num_of_BD_Directory (= 01 ₁₆)	8	Uimsbf
Use_SKB_Unified_MKB_Flag	1	Bslbf
(reserved)	15	Bslbf
For(I=0; I < Num_of_BD_Directory; I++){		
CPS_Unit_number for First Playback#I	16	Uimsbf
CPS_Unit_number for Top Menu#I	16	Uimsbf
Num_of_Title#I	16	Uimsbf
For(J=1; J < Num_of_Title+1; J++){		
(reserved)	16	Bslbf
CPS_Unit_number for Title#J in Directory #I	16	Uimsbf
}		
}		
}		

Application_Type field (8 bits) indicates the type of AV Application which is used with the CPS Unit Key File. For BDMV Application, the value of Application_Type shall be 1 to indicate that the CPS Unit Key File is associated to the BDMV Application and the syntax complies with what is described in Table 3-13.

Num_of_BD_Directory field (8 bits) indicates the number of BD application directories recorded on the media. For BDMV Application, the value of Num_of_BD_Directory shall be 1, because BDMV Application uses only one directory (“\BDMV” directory).

Use_SKB_Unified_MKB_Flag indicates whether or not Sequence Key Blocks and Unified MKBs are used on the disc. Table 3-14 shows the meaning of Use_SKB_Unified_MKB_Flag.

Table 3-14 Use_SKB_Unified_MKB_Flag

Use_SKB_Unified_MKB_Flag	Meaning
0 ₂	Neither Sequence Key Blocks nor Unified MKBs are used on the disc
1 ₂	Both Sequence Key Blocks and Unified MKBs are used on the disc

CPS_Unit_number for First Playback#I field (16 bits) indicates the CPS Unit number that First Playback belongs to. If First Playback is not on the BD Pre-recorded Disc, this field shall be set to 0000₁₆.

CPS_Unit_number for Top Menu#I field (16 bits) indicates the CPS Unit number that Top Menu belongs to. If Top Menu is not on the BD Prerecorded Disc, this field shall be set to 0000₁₆.

Num_of_Title#I field (16 bits) indicates the number of titles under the Ith BD application directory. For BDMV Application, the value of I shall be 1. Note that this value shall be equal to or more than the number specified in the number_of_Titles in the index.bdmv file.

CPS_Unit_number for Title#J in Directory #I field (16 bits) indicates the CPS Unit number that each Title belongs to.

Table 3-15 shows the data structure for Unit_Key_Block() of CPS Unit Key File for BDMV Application.

Table 3-15 Data Format of Unit_Key_Block() for BDMV Application

Syntax	No. of bits	Mnemonic
Unit_Key_Block(){		
Num_of_CPS_Unit	16	Uimsbf
(reserved)	112	Bslbf
For(I=1; I < Num_of_CPS_Unit+1; I++){		
MAC of PMSN#I	128	Bslbf
MAC of Device Binding Nonce#I	128	Bslbf
Encrypted CPS Unit Key for CPS Unit#I	128	bslbf
}		
}		

Num_of_CPS_Unit field (16 bits) indicates the number of CPS Units on the disc.

MAC of PMSN field contains the 16-byte MAC of Pre-recorded Media Serial Number calculated by using CPS Unit Key for each CPS Unit. The MAC of PMSN is generated as follows:

$$\text{CMAC}(K_{\text{cu}}, \text{Pre-recorded Media Serial Number})$$

If Binding type defined in Table 3-32 of this specification indicates “Media Binding” or “Device/Media Binding” and a Licensed Player is about to activate such Title, the Licensed Player shall calculate the MAC of PMSN using the PMSN recorded on the media inserted and shall verify the matching between MAC of PMSN in CPS Unit Key File and the MAC value calculated by the Licensed Player. If the verification fails, the Licensed Player shall not start the playback of Titles in the corresponding CPS Unit. Activation of Title is defined in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*.

(Note) In case that the CPS Unit is not bound to the Pre-recorded Media Serial Number, the MAC of PMSN field shall be set to all-zero. In other words, this field on the BD-ROM disc is always set to all-zero. Practically, this field is used only in the case that the Virtual File System is used for downloaded AACs Content in Binding Unit Data Area of Local Storage. For the Virtual File System, refer to Section 4.1 of this specification.

MAC of Device Binding Nonce field contains the 16-byte MAC of Device Binding Nonce calculated by using CPS Unit Key for each CPS Unit. The Device Binding Nonce shall be 128-bit statistically unique number, and shall be stored in Licensed Player that has AACS On-line capability. Licensed Player shall be implemented in a way that the Device Binding Nonce cannot be modified by the user.

The MAC of Device Binding Nonce is generated as follows:

$$\text{CMAC}(K_{cu}, \text{Device Binding Nonce})$$

If Binding Type defined in Table 3-32 of this specification indicates “Device/Content Binding” or “Device/Media Binding” and a Licensed Player is about to activate such Title, the Licensed Player shall calculate the MAC of Device Binding Nonce stored in the Licensed Player and shall verify the matching between MAC of Device Binding Nonce in CPS Unit Key File and the MAC value calculated by the Licensed Player. If the verification fails, the Licensed Player shall not start the playback of Titles in the corresponding CPS Unit.

(Note) In case that the CPS Unit is not bound to the Licensed Player, the MAC of Device Binding Nonce field shall be set to all-zero. In other words, this field on the BD-ROM disc is always set to all-zero. Practically, this field is used only in the case that the Virtual File System is used for downloaded AACS Content in Binding Unit Data Area of Local Storage. For the Virtual File System, refer to Section 4.1 of this specification.

Encrypted CPS Unit Key field contains the 16 bytes of the encrypted CPS Unit Key (K_{cu}) for each CPS Unit. The CPS Unit Key is encrypted as follows:

$$\text{AES-128E}(K_{vu}, K_{cu})$$

where K_{vu} denotes a Volume Unique Key defined in Section 3.3 of the AACS *Pre-recorded Video Book* of this specification.

3.9.4 CPS Unit Usage File (CPSUnitXXXXX.cci)

Each CPS Unit on the BD-ROM disc has an associated CPS Unit Usage File. CPS Unit Usage File is the Usage Rules for BD-ROM disc and describes the CCI and related information of each CPS Unit. Each CPS Unit Usage File associated to a CPS Unit shall be stored in the “CPSUnitXXXXX.cci” file in the “\AACS” directory and in the “\AACS\DUPLICATE” directory. Here, XXXXX shall be the 5-digit number. XXXXX shall be equal to the CPS_Unit_number to which the CCI file is associated. The extension shall be “cci”.

Table 3-16 shows the data structure for the CPS Unit Usage File.

Table 3-16 Data Structure for CPS Unit Usage File

Byte	Bit	7	6	5	4	3	2	1	0		
0	:	Primary Header								16 bytes	2048 bytes
15	:										
16	:	Primary CCI Area								2032 bytes	
	:										
2047	:										
2048	:	Secondary Header								16 bytes	(2048*N) bytes : Option
2063	:										
2064	:	Secondary CCI Area								(2048*N-16) bytes	
	:										
2048*N-1	:										

Primary Header (16 bytes) includes the number of CCI loops in the Primary CCI Area.

Primary CCI Area (2032 bytes) includes one or more CCI_and_other_info() blocks.

Secondary Header (16 bytes) includes the number of CCI loops in the Secondary CCI Area.

Secondary CCI Area (2048*N -16 bytes) includes one or more CCI_and_other_info() blocks.

(Note) The data structure after Byte2048 is Option. However, if Secondary CCI Area is used, the structure in Table 3-16 shall be used. The Licensed Player shall refer to the Primary CCI Area. If the Secondary CCI Area is on the disc, the Licensed Player may refer to the both CCI Areas.

Table 3-17 shows the syntax for the CPS Unit Usage File.

Table 3-17 Syntax for CPS Unit Usage File

Syntax	No. of bits	Mnemonics	Data Block
CPS Unit Usage File {			-
Number_of_Primary_CCI_loops	16	uimsbf	Primary Header
(reserved)	112	bslbf	
for(I=0; I< Number_of_Primary_CCI_loops; I++){			Primary CCI Area
CCI_and_other_info()			
}			
(reserved)	X (*1)	bslbf	
			-
Number_of_Secondary_CCI_loops	16	uimsbf	Secondary Header
(reserved)	112	bslbf	
for(I=0; I< Number_of_Secondary_CCI_loops; I++){			Secondary CCI Area
CCI_and_other_info()			
}			
(reserved)	Y (*2)	bslbf	
}			-

(*1) X is decided to fill the Primary CCI Area (2032 bytes)

(*2) Y is decided to fill the Secondary CCI Area (2048*N-16 bytes)

Number_of_Primary_CCI_loops indicates the number of CCI_and_other_info() blocks in the Primary CCI Area.

Number_of_Secondary_CCI_loops indicates the number of CCI_and_other_info() blocks in the Secondary CCI Area.

3.9.4.1 CCI_and_other_info()

CCI_and_other_info() contains CCI and title usage information for each CPS Unit.

Table 3-18 shows the data structure for CCI_and_other_info().

Table 3-18 Syntax for CCI_and_other_info()

Syntax	No. of bits	Mnemonic
CCI_and_other_info() {		
CCI_and_other_info_type	16	uimsbf
CCI_and_other_info_version	16	uimsbf
CCI_and_other_info_data_length	16	uimsbf
CCI_and_other_info_data()	L*8 (*)	
}		

(*) L is the value of CCI_and_other_info_data_length field

CCI_and_other_info_type indicates what type of CCI and related information of a CPS Units is described in CCI_and_other_info_data(). Table 3-19 shows the bit assignment of CCI_and_other_info_type.

Table 3-19 Bit assignment for CCI_and_other_info_type

CCI_and_other_info_type	Meaning
0000 ₁₆	Reserved
0001 ₁₆	Reserved for Basic CCI for BD-CPS
0002 ₁₆ -0100 ₁₆	Reserved
0101 ₁₆	Basic CCI for AACS
0102 ₁₆	Reserved for CCI Sequence Information
0103 ₁₆ -0110 ₁₆	Reserved
0111 ₁₆	Enhanced Title Usage for AACS
0112 ₁₆	Key Management Information for On-line Function
0113 ₁₆	Content Owner Authorized Outputs Information
0114 ₁₆ -FFFF ₁₆	Reserved

Basic CCI for AACS (CCI_and_other_info_type=0101₁₆) is used to describe the basic CCI information for AACS. There shall be exactly one Basic CCI for AACS on one CPS Unit, and it shall be contained in the Primary CCI Area.

Enhanced Title Usage for AACS (CCI_and_other_info_type=0111₁₆) is used to describe the Enhanced Title Usage information for AACS. Enhanced Title Usage for AACS is not required for Basic Title but is mandatory for the Enhanced Title.

Key Management Information for On-line Function (CCI_and_other_info_type=0112₁₆) is used to describe the Binding Type for this CPS Unit. Four Binding Types are defined in Section 5.5 of the *Introduction and Common Cryptographic Elements* book of this specification. If Key Management Information for On-line Function is recorded, it shall be contained in the Primary CCI Area.

CCI_and_other_info_version indicates the version number of CCI_and_other_info_data() for each CCI_and_other_info_type. This value is defined for each CCI_and_other_info_type.

CCI_and_other_info_data_length indicates the byte length of CCI_and_other_info_data() for each CCI_and_other_info_type. This value is defined for each CCI_and_other_info_type.

CCI_and_other_info_data() is the description area for CCI and related information of a CPS Unit. The structure of this field is separately defined for each CCI_and_other_info_type.

The length of the CCI_and_other_info() field in the Primary CCI Area shall be less than or equal to 2012 bytes. The Primary CCI Area may contain multiple different types of CCI_and_other_info().

The Secondary CCI Area may also contain multiple different types of CCI_and_other_info(). The Secondary CCI Area can contain the CCI_and_other_info() that cannot be stored in the Primary CCI Area. When the size of CCI_and_other_info() is greater than 2012 bytes, the CCI_and_other_info() shall be stored in the Secondary CCI Area.

If there is an unknown (Reserved) CCI_and_other_info_type, Licensed Player shall ignore this CCI_and_other_info().

If there is a higher version of CCI_and_other_info_version than the version supported by Licensed Player, Licensed Player shall ignore this CCI_and_other_info().

If reserved bits in each CCI_and_other_info_data() are not set to zero, Licensed Player shall ignore these bits and only use non-reserved bits.

Note: If the Licensed Player cannot find the supporting version of Basic CCI for AACs, the Licensed Player shall not start playback of the AACs Content.

3.9.4.2 Basic CCI for AACs

Table 3-20 shows the data structure of CCI_and_other_info() for Basic CCI for AACs.

Table 3-20 Syntax of Basic CCI for AACs

Syntax	No. of bits	Mnemonics
Basic CCI for AACs {		
CCI_and_other_info_type (=0101 ₁₆)	16	uimsbf
CCI_and_other_info_version (=0100 ₁₆)	16	uimsbf
CCI_and_other_info_data_length (=0084 ₁₆)	16	uimsbf
(reserved)	5	bslbf
EPN	1	bslbf
CCI	2	bslbf
(reserved)	3	bslbf
Image_Constraint_Token	1	bslbf
Digital_Only_Token	1	bslbf
APSTB	3	bslbf
Num_of_Title	16	
for (I = 0; I < Num_of_Title; I++){		
Type_of_Title#I	1	uimsbf
}		
(reserved)	1024 – Num_of_Title	bslbf
}		

CCI_and_other_info_type shall be 0101₁₆ for Basic CCI for AACs.

CCI_and_other_info_version shall be 0100₁₆ for this version.

CCI_and_other_info_data_length shall be 0084₁₆ for Basic CCI for AACs.

The EPN field indicates the value of the Encryption Plus Non-assertion (EPN). Table 3-21 shows the meaning of EPN. Note that a Licensed Player refers to this field only if CCI is set to 00₂ (Copy Control Not Asserted). Otherwise, a Licensed Player shall ignore this field.

Table 3-21 EPN

EPN	Meaning
0 ₂	EPN-asserted
1 ₂	EPN-unasserted

The CCI field indicates the value of the copy control information. Table 3-22 shows the meaning of CCI.

Note that the EPN field and the CCI field are together referred to as the CCI field in the AACS License Agreement.

Table 3-22 CCI

CCI	Meaning
00 ₂	Copy Control Not Asserted
01 ₂	Reserved for No More Copy
10 ₂	Copy One Generation
11 ₂	Never Copy

The Image_Constraint_Token field indicates the value of Image Constraint Token. Table 3-23 shows the meaning of Image_Constraint_Token.

Table 3-23 Image_Constraint_Token

Image_Constraint_Token	Meaning
0 ₂	High Definition Analog Output in the form of Constrained Image
1 ₂	High Definition Analog Output in High Definition Analog Form

The Digital_Only_Token field indicates the value of Digital Only Token. Table 3-24 shows the meaning of Digital_Only_Token.

Table 3-24 Digital_Only_Token

Digital_Only_Token	Meaning
0 ₂	Output of decrypted content is allowed for Analog/Digital Outputs
1 ₂	Output of decrypted content is allowed only for Digital Outputs

The APSTB field indicates the value of analog copy protection information. Table 3-25 shows the meaning of APSTB.

Table 3-25 APSTB

APSTB	Meaning
000 ₂	APS off
001 ₂	APS1 on: type 1 (AGC)
010 ₂	APS1 on: type 2 (AGC + 2L colourstripe)
011 ₂	APS1 on: type 3 (AGC + 4L colourstripe)
100 ₂ -101 ₂	Reserved
110 ₂ -111 ₂	APS2 on

Num_of_Title indicates the number of Title contained in this CPS Unit. Note that the First Playback and the Top Menu are not included in the “Title” and shall be Basic Title.

Type_of_Title#I indicates whether the Title#I in this CPS Unit is Basic Title or Enhanced Title. Table 3-26 shows the meaning of Type_of_Title#I. Note that Title number in a specific CPS Unit is assigned in the ascending order of the title_id of each Title, which belongs to this CPS Unit.

Enhanced Title means a Title that requires Permission from Remote Server before playback. On the other hand, Basic Title does not require Permission. Details of Permission are defined in Sections 3.9.4.3 and 4.4.1.5 of this specification.

Note that the Licensed Player that does not have AACS On-line capability shall not playback Enhanced Title.

Table 3-26 Type_of_Title#I

Type	Meaning
0 ₂	Basic Title
1 ₂	Enhanced Title

3.9.4.3 Enhanced Title Usage for AACS

Table 3-27 shows the data structure of CCI_and_other_info() for Enhanced Title Usage for AACS. Enhanced Title Usage for AACS shall be used only for Enhanced Title and shall be defined for each Title not CPS Unit.

Note that if the Licensed Player is capable of storing Cacheable Permission (i.e. a Secure Clock is implemented) and storage for Cacheable Permission is available at that time, the Licensed Player shall refer to this Enhanced Title Usage for AACS. For the details of Cacheable Permission, refer to Section 4.4.1.5 of this specification.

Table 3-27 Syntax of Enhanced Title Usage for AACS

Syntax	No. of bits	Mnemonics
Enhanced Title Usage for AACS {		
CCI_and_other_info_type (=0111 ₁₆)	16	uimsbf
CCI_and_other_info_version (=0100 ₁₆)	16	uimsbf
CCI_and_other_info_data_length (=0020 ₁₆)	16	uimsbf
Title_id	16	uimsbf
(reserved)	7	bslbf
Cacheable	1	uimsbf
Period	16	uimsbf
After()	56	
Before()	56	
(reserved)	104	bslbf
}		

CCI_and_other_info_type shall be 0111₁₆ for Enhanced Title Usage for AACCS.

CCI_and_other_info_version shall be 0100₁₆ for this version.

CCI_and_other_info_data_length shall be 0020₁₆ for Enhanced Title Usage for AACCS.

Title_id indicates the title_id of Title which this Title Usage is covered, where title_id is defined in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*.

Cacheable indicates whether this Permission can be cached or not. Table 3-28 shows the meaning of Cacheable.

Table 3-28 Cacheable

Cacheable	Meaning
0 ₂	Cacheable Permission
1 ₂	Instant Permission

Period indicates the number of integer hours that the Cacheable Permission is valid. A Licensed Player may always delete it earlier.

After() indicates that a Licensed Player shall not begin playing the title until the date specified. The date is specified by the format shown in Table 3-29.

Before() indicates that a Licensed Player shall not begin playing the title after the date specified. The date is specified by the format shown in Table 3-29.

Note that fields “Period”, “After” and “Before” are valid only in case of Cacheable Permission. In case of Instant Permission, these fields shall be set to all-zero, and shall be ignored by a Licensed Player.

If the value of “Period”, “After” or “Before” is all zero, this means that the value is undefined. Otherwise, the value is defined. In the case that only “After” is defined and “Before” is undefined, then the title can be played back any time on or after the date specified. In the same way, in the case that only “Before” is defined and “After” is undefined, then the title can be played back any time on or before the date specified.

Table 3-29 Syntax for After() and Before()

Syntax	No. of bits	Mnemonics
After() or Before(){		
First_digit_of_year	4	uimsbf
Second_digit_of_year	4	uimsbf
Third_digit_of_year	4	uimsbf
Fourth_digit_of_year	4	uimsbf
First_digit_of_month	4	uimsbf
Second_digit_of_month	4	uimsbf
First_digit_of_date	4	uimsbf
Second_digit_of_date	4	uimsbf
First_digit_of_hour	4	uimsbf
Second_digit_of_hour	4	uimsbf
First_digit_of_minute	4	uimsbf
Second_digit_of_minute	4	uimsbf
Timezone	8	imsbf
}		

Timezone is reserved for future use, to indicate the time difference in quarter hours between Coordinated Universal Time (UTC) and the local standard time. In this revision, this field shall be set to zero. The Licensed Player shall ignore this field, and shall interpret the date/time value for After() or Before() as UTC.

Note that the URL of the Remote Server is not included in Enhanced Title Usage for AACs, but is handled by a BD-J Application.

3.9.4.4 Key Management Information for On-line Function

Table 3-30 shows the data structure of CCI_and_other_info() for Key Management Information for On-line Function.

Table 3-30 Syntax of Key Management Information for On-line Function

Syntax	No. of bits	Mnemonics
Key Management Information for On-line Function {		
CCI_and_other_info_type (=0112 ₁₆)	16	uimsbf
CCI_and_other_info_version (=0100 ₁₆)	16	uimsbf
CCI_and_other_info_data_length (=0010 ₁₆)	16	uimsbf
Unit Key Status	8	uimsbf
Binding Type	8	uimsbf
(reserved)	112	bslbf
}		

CCI_and_other_info_type shall be 0112₁₆ for Key Management Information for On-line Function.

CCI_and_other_info_version shall be 0100₁₆ for this version.

CCI_and_other_info_data_length shall be 0010₁₆ for Key Management Information for On-line Function.

The Unit Key Status field indicates the status of Unit Key associated to the CPS Unit. Table 3-31 shows the meaning of Unit Key Status. For example, if the Unit Key Status is 02₁₆, the Unit Key for the CPS Unit does not exist on the BD-ROM Media, and some additional process (e.g. network transaction) to get Unit Key is necessary before the playback of the AACS Content.

Table 3-31 Unit Key Status

Unit Key Status	Meaning
00 ₁₆	Reserved
01 ₁₆	Unit Key is recorded on the BD-ROM Media
02 ₁₆	Unit Key is not recorded on the BD-ROM Media
Others	Reserved

The Binding Type field indicates the Binding Type applied to the downloaded AACS Content that belong to the CPS Unit.

Table 3-32 shows the meaning of Binding Type. If Key Management Information for On-line Function is not recorded in the CPS Unit Usage File, Licensed Player shall regard this CPS Unit as Content Binding.

Further information and definition of each Binding Type are described in Section 5.4 of the *Introduction and Common Cryptographic Elements* book of this specification.

Table 3-32 Binding Type

Binding Type	Meaning
00 ₁₆	Reserved
01 ₁₆	Media Binding
02 ₁₆	Content Binding
03 ₁₆	Device/Content Binding
04 ₁₆	Device/Media Binding
Others	Reserved

3.9.4.5 Content Owner Authorized Outputs Information

Table 3-33 shows the data structure of CCI_and_other_info() for Content Owner Authorized Outputs Information.

Table 3-33 Syntax of Content Owner Authorized Outputs Information

Syntax	No. of bits	Mnemonics
Content Owner Authorized Outputs Information {		
CCI_and_other_info_type (=0113 ₁₆)	16	uimsbf
CCI_and_other_info_version (=0100 ₁₆)	16	uimsbf
CCI_and_other_info_data_length (=0010 ₁₆)	16	uimsbf
Output Control Bits	128	uimsbf
}		

CCI_and_other_info_type shall be 0113₁₆ for Content Owner Authorized Outputs Information.

CCI_and_other_info_version shall be 0100₁₆ for this version.

CCI_and_other_info_data_length shall be 0010₁₆ for Content Owner Authorized Information.

The Output Control Bits field contains Content Owner Authorized Output Control Bits. This field shall be filled with 00₁₆ unless otherwise defined in the Compliance Rules.

3.10 Encrypted Packs

3.10.1 Encryption Scheme

When AACs encryption is applied to Clip AV stream files under the “\BDMV” directory, encryption is applied to every Aligned Unit in the file. An Aligned Unit consists of 32 MPEG source packets: Each MPEG source packet consists of the TP_extra_header (4 bytes) and an MPEG Transport packet (188 bytes). The total size of an Aligned Unit is 6144 bytes, which is equal to the size of 3 logical sectors.

The final 6128 bytes of each Aligned Unit is encrypted using the Block Key and AES-128CBCE. A new CBC cipher chain is started for each Aligned Unit (see Figure 3-7).



Figure 3-7 CBC chaining on “Aligned Unit” basis

The Initialization Vector of CBC Mode used in this scheme is described in Section 2.1.2 of *Introduction and Common Cryptographic Elements* book of this specification.

The first 16 bytes of each Aligned Unit is used as the seed for calculating the Block Key. Calculation method for the Block key is described in Figure 3-8.

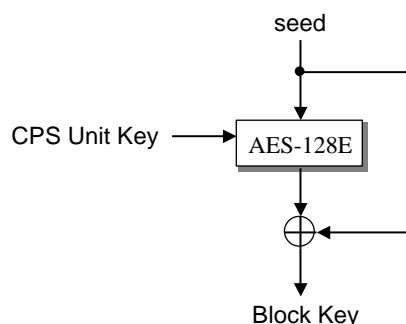


Figure 3-8 Calculation method for the Block Key from the CPS Unit Key

3.10.2 Copy Permission Indicator

MPEG source packet in Clip AV stream file consists of the TP_extra_header (4 bytes) and an MPEG Transport packet (188 bytes). Table 3-34 shows the data structure for TP_extra_header.

Table 3-34 TP_extra_header

Syntax	No. of bits	Mnemonic
TP_extra_header {		
Copy_permission_indicator	2	uimsbf

Arrival_time_stamp	30	uimsbf
}		

Copy_permission_indicator shall be set to 11₂ if the data is encrypted, or shall be set to 00₂ if the data is not encrypted. If the Licensed Player encounters the packet with Copy_permission_indicator set to 10₂ or 01₂, the data shall be considered encrypted.

In case that Bus Encryption is applied, the data that has Copy_permission_indicator set to 11₂ and 00₂ is transferred in bus-encrypted form and unencrypted form respectively. In other words, for Bus-Encryption-enabled AACS Content and Licensed Drives, the host can distinguish if the data is bus encrypted or not, by referring to the Copy_permission_indicator. If the Licensed Player encounters the packet with the Copy_permission_indicator set to 10₂ or 01₂ in this case, it shall be considered bus-encrypted.

3.11 Embedded CCI in AV Content

As specified in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*, HDMV_copy_control_descriptor shall be embedded in AV Content.

The HDMV_copy_control_descriptor is used for the DTCP and contains the same fields and the same meaning defined in accordance with the DTCP_descriptor specified in *Digital Transmission Content Protection Specification Volume 1 Revision 1.4*. Table 3-35 presents the syntax. The information recorded in the CPS Unit Usage File defined in Section 3.9.4 and this HDMV_copy_control_descriptor shall be consistent unless otherwise defined in this chapter. For Licensed Player implementation, the information recorded in the CPS Unit Usage File has priority rather than the information recorded in Embedded CCI.

Table 3-35 HDMV_copy_control_descriptor

Syntax	No. of bits	Mnemonics
HDMV_copy_control_descriptor {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
CA_System_ID	16	uimsbf
For (I = 0 ; I < descriptor_length – 2 ; I++){		
private_data_byte	8	bslbf
}		
}		

Descriptor_tag field (1 byte) shall be set to 88₁₆. Descriptor_length field (1 byte) indicates the number of bytes immediately following this field and up to the end of this descriptor. CA_System_ID (2 bytes) shall be set to 0FFF₁₆.

3.11.1 private_data_byte

Table 3-36 shows the data format for private_data_byte.

Table 3-36 private_data_byte

Syntax	No. of bits	Mnemonics
Private_data_byte {		
(reserved)	1	bslbf
Retention_Move_Mode	1	bslbf
Retention_State	3	bslbf
EPN	1	bslbf
CCI	2	bslbf
(reserved)	5	bslbf
Image_Constraint-Token	1	bslbf
APS	2	bslbf
}		

Retention_Move_Mode and Retention_State fields are defined in the DTCP_descriptor, but these fields are not used in this specification.

EPN field indicates the value of the Encryption Plus Non-assertion (EPN) as shown in Table 3-37.

Table 3-37 EPN

EPN	Meaning
0 ₂	EPN-asserted
1 ₂	EPN-unasserted

CCI field indicates the value of the copy control information as shown as Table 3-38.

Table 3-38 CCI

CCI	Meaning
00 ₂	Copy Control Not Asserted
01 ₂	Reserved for No More Copy
10 ₂	Copy One Generation
11 ₂	Never Copy

Image_Constraint-Token field indicates the value of the Image_Constraint-Token as shown in Table 3-39.

Table 3-39 Image_Constraint_Token

Image_Constraint_Token	Meaning
0 ₂	High Definition Analog Output in the form of Constrained Image
1 ₂	High Definition Analog Output in High Definition Analog Form

APS field indicates the value of the analog copy protection information as shown in Table 3-40. The value of APS field shall be set in accordance with the *AACS Compliance Rules*.

Table 3-40 APS

APS	Meaning
00 ₂	copy control not asserted
01 ₂	APS on: type 1 (AGC)
10 ₂	APS on: type 2 (AGC + 2L colourstripe)
11 ₂	APS on: type 3 (AGC + 4L colourstripe)

Reserved bits are reserved for future definition and currently defined to have a value of one.

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Chapter 4

Details for Uses of On-line Connections

4. Introduction

The information related to the content use with network transaction is specified in Chapter 5 of *Introduction and Common Cryptographic Elements* book of this specification. This chapter describes additional details of on-line functions that are specific to the use of AACS encryption with BD-ROM Media and Application Format.

4.1 Virtual File System

BD-ROM application format introduces a concept of Virtual Package. By use of this concept, downloaded content in the Binding Unit Data Area of Local Storage (e.g. HDD) and pre-recorded content on the BD-ROM are combined as one virtual “packaged media”.

According to the application image described in Chapter 5 of *Introduction and Common Cryptographic Elements* book of this specification, downloaded files include not only content files, but also files for copy protection (e.g. CPS Unit Key File, etc. recorded in AACS directory).

To realize the concept of Virtual Package, the BD-ROM application format specifies Binding Unit Data Area in local storage and the mechanism of Virtual File System (VFS) to play the content on BD-ROM Disc together with the files recorded in Binding Unit Data Area. Files for copy protection are also covered by this mechanism. For more detail, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*.

If the Licensed Player implements VFS for the files defined in the BD-ROM application format, the Licensed Player shall apply the VFS for copy protection files as defined in this specification.

If the Licensed Player implements AACS On-line APIs in addition to BD-J network capability, the Licensed Player shall have capability to process the content recorded in Binding Unit Data Area with any of four binding methods defined in Section 5.5 of AACS *Introduction and Common Cryptographic Elements* book of this specification.

This section describes the application of the Virtual Package concept to files in the AACS directories.

Figure 4-1 shows the example of the VFS concept applied to files in the AACS directories.

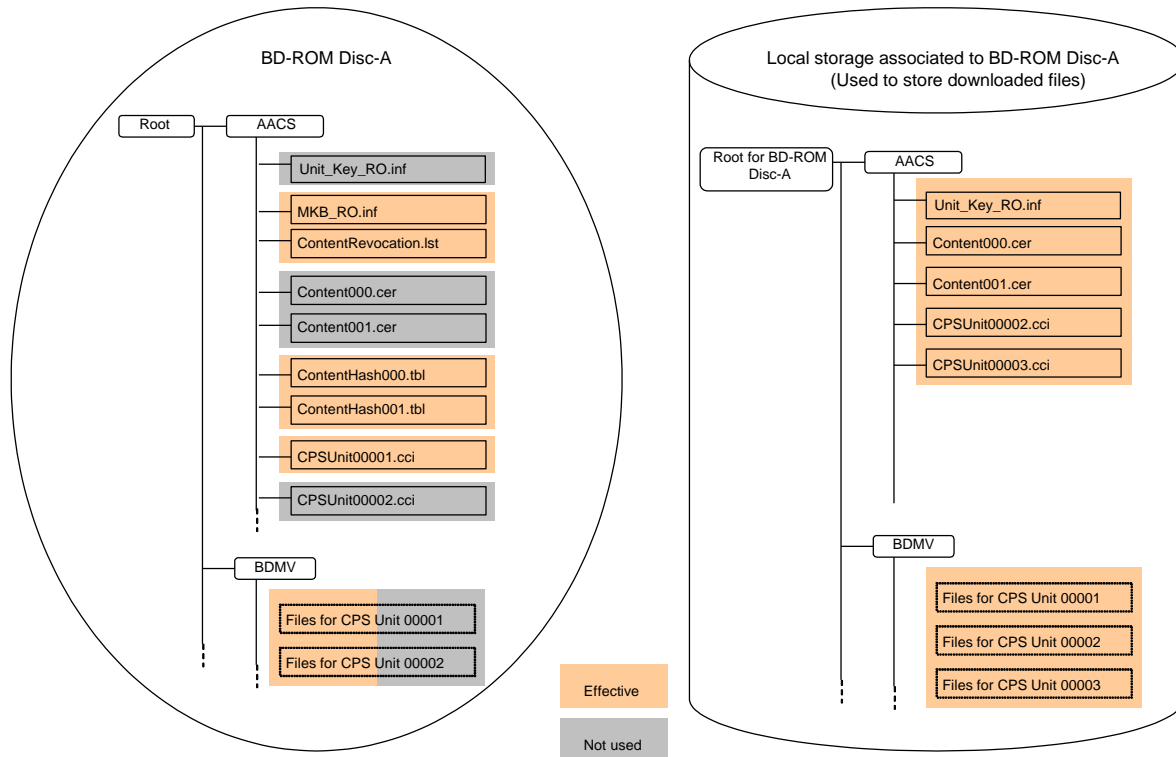


Figure 4-1 Virtual File System Concept to files in the AACS and BDMV directory

In this example, CPS Unit#1 and CPS Unit#2 are originally recorded on the BD-ROM Disc-A as described in the left hand side of Figure 4-1.

The downloaded files are recorded in the specific area of the Binding Unit Data Area which is associated with the specific disc (ex. BD-ROM Disc-A). In this example, the downloaded content are some updated files for CPS Unit#1 and CPS Unit#2, and new content for CPS Unit#3. Figure 4-1 shows only the partial update of CPS Unit#1 and CPS Unit#2, and new addition of CPS Unit#3. And the details of AV Application files are omitted.

Note that the actual directory name and file name registered in the File System of Local Storage media may be different from the directory name and file name defined for BD-ROM. However, VFS provides name mapping mechanism from the actual file name used on Local Storage to the BD-ROM defined file name, and VFS recognizes the directory and file structure as described in Figure 4-1. Figure 4-2, Figure 4-5, Figure 4-8, and Figure 4-11 are also described based on the application of name mapping mechanism, but the details of name mapping process is omitted in the figures.

For the detail of AV application files in the BDMV directory and VFS for AV application files, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification*.

Even when some downloaded files are recorded in the Binding Unit Data Area, verifying Content Certificate process shall be completed according to the procedure defined in Section 2.3.3 of this specification. Two procedures for Content Certificate verification are defined in Section 2.6 of *AACS Pre-recorded Video Book* of this specification. For procedure a), verification shall be completed before the construction of the VFS. On the other hand, for procedure b), verification shall be done during playback. Note that for both procedures, only the files recorded in BD-ROM Disc are used for verification. Refer to Section 4.1.1 of this specification for the details of these specific files.

For each file in the AACCS directories, the actual meaning of updates is explained using the example of Figure 4-1.

CPS Unit Key File: CPS Unit Key File is updated in this example. The CPS Unit Key File in BD-ROM Disc has the encrypted keys for CPS Unit#1 and CPS Unit#2. The CPS Unit Key File in the Binding Unit Data Area has the encrypted keys for all of CPS Unit#1, CPS Unit#2, and CPS Unit#3. Therefore, the CPS Unit Key File in the Binding Unit Data Area has all encrypted keys that are necessary to play all the content in the VFS.

Content Certificate: Content Certificates are updated in this example in parallel with updating the CPS Unit Usage File. Content Certificate includes the hash values of each CPS Unit Usage File. It is necessary to update the Content Certificate when the CPS Unit Usage File is updated or added.

CPS Unit Usage File: CPS Unit Usage File for newly downloaded CPS Unit is added during the downloading transaction. And the CPS Unit Usage File in the BD-ROM Disc can be used unless the CPS Unit Usage was changed during the downloading transaction according to the intention of content participants. In the case that CPS Unit Usage File in the BD-ROM Disc is updated by the downloading transaction, the new CPS Unit Usage File which has the same file name is downloaded to the Binding Unit Data Area, and set to effective. On the other hand, in the case that CPS Unit Usage File is added by the downloading transaction, the new CPS Unit Usage File which has the different file name is downloaded to the Binding Unit Data Area, and set to effective. The Licensed Player shall verify the Hash_Value_of_CPS_Unit_Usage_File as defined in Section 2.3.3.2 of this specification. In addition to verification of the Hash_Value_of_CPS_Unit_Usage_File, the Licensed Player shall also verify the Signature of Content Certificate associated with that CPS Unit Usage File before playback of the associated title.

If at least one AACCS file listed above is replaced (by e.g. construction or update of Virtual Package), the Licensed Player shall process the file again before playback.

Figure 4-2 shows the disc image of the content on the Binding Unit Data Area.

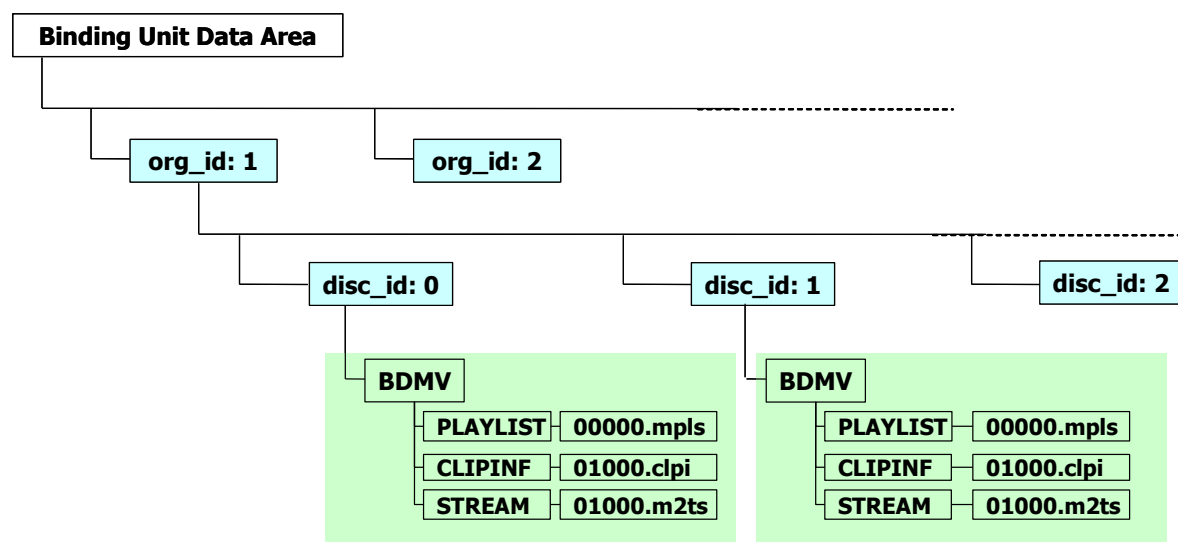


Figure 4-2 Disc Image of Content on the Binding Unit Data Area

The content on the Binding Unit Data Area are stored under the disc-dependent directory in organization-dependent directory by using the disc_id and organization_id recorded on associated BD-ROM Disc. Organization_id may be assigned by each Content Provider and disc_id is assigned to each content. For the details of the organization_id and the disc_id, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*.

4.1.1 AACS Files for VFS

When AACS files are recorded on Binding Unit Data Area, the same files on BD-ROM Disc shall be replaced by the files on Binding Unit Data Area when VFS is constructed.

However, Media Key Block and Sequence Key Block / Unified MKB shall be processed without VFS, so the replacement of these files has no effect on MKB and SKB / uMKB process. Content revocation process shall be also processed without VFS, so the replacement of Content Hash Table and Content Revocation List has no effect on content revocation.

In other words, the Licensed Player shall not use MKB, SKB, uMKB, Content Hash Table and Content Revocation List on the Local Storage, but use these AACS files on the BD-ROM for Process MKB, SKB, uMKB or Content Revocation.

4.2 System Model

As an overview, the On-line System based on AACS and BD-ROM application format consists of three modules: Remote Server, BD-J Application and AACS Layer. Figure 4-3 shows the relation between these three modules.

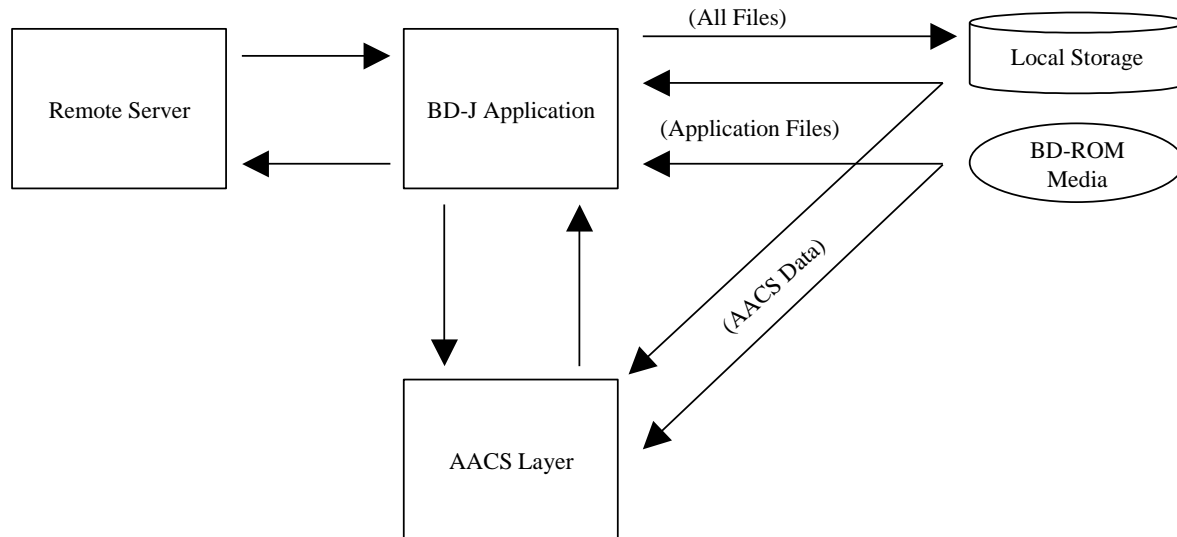


Figure 4-3 System Model: Relation between three modules

BD-J Application sends a request message and receives a response message. These messages are defined in Section 4.3 of this specification as “connection protocol”. Some types of response message may be recorded as a file to the Binding Unit Data Area; e.g. Clip AV stream file, CPS Unit Key File and CPS Unit Usage File.

BD-J Application reads a file from the Binding Unit Data Area and BD-ROM. This file includes Clip AV stream file and Database files defined in the BD-ROM application format, and AACS files. However, BD-J Application does not have direct read access to AACS defined data (e.g. Volume ID, PMSN etc.).

When BD-J Application needs the information related to the AACS Layer, the BD-J Application calls the AACS Layer and receives a return message from it. These messages are defined in Section 4.4 of this specification as APIs between AACS Layer and BD-J Application. Using these APIs, BD-J Application requests AACS Layer to access AACS defined data.

4.3 Connection Protocol between Remote Server and BD-J Application

BD-ROM application format defines a programmable environment to enhance its interactive feature. By use of this programmable environment, the connection protocol between Remote Server and BD-J Application can be implemented by a service provider’s own choice. As an example, the Example Protocol for On-line Enabled Content defined in the *Introduction and Common Cryptographic Elements* book of this specification can be utilized for this connection protocol between the Remote Server and the BD-J Application. Note that BD-J supports TLS with cipher suite TLS_RSA_WITH_AES_128_CBC_SHA, which is used in the Example Protocol for On-line Enabled Content.

4.4 APIs between AACS Layer and BD-J Application

The connection protocol for the on-line transactions is defined in Section 5.3 of AACS *Introduction and Common Cryptographic Elements* book of this specification. This section provides the list of APIs that can be used by BD-J Applications to execute the network transactions. The BD-J Application shall check player's VFS implementation and AACS On-line capability by referring to Player Status Register 31 (PSR31) value and System Property respectively. The APIs defined in this section shall be called only when the player has capability to process such APIs appropriately. After checking the player's capability, the API defined in this section can be called in any time from the BD-J Application, unless otherwise specified. The Licensed Player with AACS On-line capability is regarded as Enhanced Device, as defined in Chapter 5 of AACS *Introduction and Common Cryptographic Elements* book of this specification.

Note that the BD-ROM application format defines that a player with BD-J network connectivity shall support the VFS. This means that the player with AACS On-line capability has VFS capability.

For Player Status Register, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*.

Further requirement and recommendation for AACS On-line API implementation and BD-J Application are defined in Annex C of this specification.

4.4.1 Package `com.aacsla.bluray.online`

4.4.1.1 Class Summary

Following four classes are defined as AACS On-line API, and shall be supported by the Licensed Player with AACS On-line capability. If the AACS On-line API is supported, such players shall support BD-J network connectivity also.

MediaAttribute

The MediaAttribute handles media attributes provided by AACS Layer.

DeviceAttribute

The DeviceAttribute handles device attributes provided by AACS Layer.

ContentAttribute

The ContentAttribute handles content attributes provided by AACS Layer.

EnablePermission

The EnablePermission handles Permission for AACS On-line Enabled Content as defined in Chapter 5 of AACS *Introduction and Common Cryptographic Elements* book of this specification.

4.4.1.2 Class MediaAttribute

```
java.lang.Object
|
+--com.aacsla.bluray.online.MediaAttribute
```

```
public class MediaAttribute
```

```
extends java.lang.Object
```

The MediaAttribute handles media attributes provided by AACSLayer.

4.4.1.2.1 Constructors

4.4.1.2.1.1 MediaAttribute

```
public MediaAttribute ( )
```

Create MediaAttribute object.

4.4.1.2.2 Methods

4.4.1.2.2.1 getVolumeID

```
public byte[ ] getVolumeID( )
```

Provide the Volume ID of the currently inserted media. Note that Volume ID is 16 bytes.

Returns:

the Volume ID. If there is no currently inserted media or any other error, returns null.

4.4.1.2.2.2 getPMSN

```
public byte[ ] getPMSN( )
```

Provide the Pre-recorded Media Serial Number of the currently inserted media. Note that Pre-recorded Media Serial Number is 16 bytes. Integrity of Pre-recorded Media Serial Number needs not be maintained outside of AACSLayer.

Returns:

the Pre-recorded Media Serial Number. If Pre-recorded Media Serial Number is not recorded in the currently inserted media, returns null. If there is no currently inserted media or any other error, returns null also.

4.4.1.3 Class DeviceAttribute

```
java.lang.Object
```

```
|
```

```
+-com.aacsla.bluray.online.DeviceAttribute
```

```
public class DeviceAttribute
```

```
extends java.lang.Object
```

The DeviceAttribute handles device attributes provided by AACSLayer.

4.4.1.3.1 Constructors

4.4.1.3.1.1 DeviceAttribute

public **DeviceAttribute** ()

Create DeviceAttribute object.

4.4.1.3.2 Methods

4.4.1.3.2.1 getDeviceBindingID

public byte[] **getDeviceBindingID**()

Provide the Device Binding Nonce of the device. Note that Device Binding Nonce is 16 bytes.

Returns:

the Device Binding Nonce. If a Licensed Player does not have Device Binding Nonce or there is any other error, returns null.

4.4.1.4 Class ContentAttribute

```
java.lang.Object
|
+--com.aacsla.bluray.online.ContentAttribute
```

public class **ContentAttribute**

extends java.lang.Object

The ContentAttribute handles content attributes provided by AACSLayer.

4.4.1.4.1 Constructors

4.4.1.4.1.1 ContentAttribute

public **ContentAttribute** ()

Create ContentAttribute object.

4.4.1.4.2 Methods

4.4.1.4.2.1 getContentCertID

public byte[] **getContentCertID**()

Provide the Content Certificate ID associated with the currently inserted media from BD-ROM or Local Storage. Note that Content Certificate ID is 6 bytes, and defined in Section 2.1 of this specification.

Returns:

the Content Certificate ID. If there is no currently inserted media or any other error, returns null. When the Content Certificate was replaced by VFS, Content Certificate ID returned by this method shall be retrieved from the Content Certificate on the Binding Unit Data Area of Local Storage. In case of dual layer disc, Content Certificate ID in Content000.cer shall be returned.

4.4.1.5 Class EnablePermission

```
java.lang.Object
|
+--com.aacsla.bluray.online.EnablePermission
```

public class **EnablePermission**

extends java.lang.Object

The EnablePermission handles on-line Permission as defined in Chapter 5 of AACCS *Introduction and Common Cryptographic Elements* book of this specification.

Note that the Licensed Player with AACCS On-line capability shall be capable of handling both Instant Permission and Cacheable Permission. However, the Licensed Player which is not capable of storing Cacheable Permission, shall treat every Cacheable Permission as an Instant Permission. The treatment of Cacheable Permission for a Licensed Player which is capable of storing Cacheable Permission is defined in Section 4.4.1.5.2.2 of this specification.

The BD-J Application shall not try to play the Titles which do not have valid Permission. The Licensed Player treats such a playback request as an illegal request and shall block the playback of such Titles. The player behavior after such an illegal request is implementation dependent.

4.4.1.5.1 Constructors

4.4.1.5.1.1 EnablePermission

public **EnablePermission** (int title_id)

Create EnablePermission object.

Parameters:

title_id – title_id of the Title which this Permission corresponds to.

(Note) First Playback and Top Menu shall not be an argument of this call because those are always Basic Title and title_id is not assigned.

4.4.1.5.2 Methods

4.4.1.5.2.1 getNonce

public byte[] **getNonce**()

Provide the Nonce generated by AACCS Layer. The number of Nonces, which a player holds, shall be one. If there is another existing Nonce that has been already generated, this call shall clear existing Nonce(s) in AACCS Layer. If the existing Nonce is cleared, setPermission() corresponding to the existing Nonce returns false because Nonce doesn't match to message. In the case of disc ejection or power off, the existing Nonce shall be cleared. Note that Nonce is 16 bytes.

Note that getNonce() can be called even for the Basic Title, and a player behavior shall be the same as Enhanced Title. If the media is inserted, the player shall always return a non-null value even if the title specified by the parameter of the constructor does not exist on the media.

Returns:

the Nonce generated by AACCS Layer. If there is no currently inserted media or any other error, returns null.

4.4.1.5.2.2 setPermission

public boolean **setPermission** (byte[] message)

throws

java.lang.NullPointerException

Set the message which is received from Remote Server to verify and activate the Permission. Note that the length of message shall be 16 bytes. This call shall clear existing Nonce. This also applies in case the argument is null.

If the Licensed Player is capable of storing Cacheable Permission, Cacheable Permission shall be kept for each combination of VolumeID and title_id.

Returns:

true: the message is verified correctly and the Permission is activated. If the Permission was already activated for the same title_id prior to this call, the Permission is overwritten by new Permission.

false: the message is not verified correctly, the length of message is not 16 bytes, or there is any other error. If the Permission was already activated for the same title_id prior to this call, the Permission shall be deactivated.

Throws:

java.lang.NullPointerException – if any of the arguments are null. If the Permission for the title_id has been already activated, the Permission for that title_id shall be deactivated.

The concept of Permission is defined in Section 5.3 of the AACCS *Introduction and Common Cryptographic Elements* book of this specification.

In the case of BD-ROM, the Encrypted Title Key (CPS Unit Key) formula is defined as follows:

$$\text{AES-128E}(K_{vu}, K_t \oplus \text{Nonce} \oplus \text{AES_H}(\text{Volume ID} \parallel \text{title_id}))$$

The procedure to check the message is also defined in 5.3 of the *AACS Introduction and Common Cryptographic Elements* book of this specification. In this formula, title_id is 4 bytes. title_id is the one used to construct the instance of EnablePermission, which calls setPermission(). K_{vu} and VolumeID are derived from the currently inserted media. K_t is the CPS Unit Key which is associated with the title specified by title_id in the package (virtual or disc) that was being used when setPermission() was called. Nonce is the one existing in AACS Layer. Concretely, a Licensed Player collects the values (K_{vu} , K_t , Nonce, VolumeID, and title_id) from a Licensed Player itself, BD-ROM or Local Storage, and calculates above formula. If the results of the calculation matched to the message set by setPermission(), the verification is successful. Otherwise, the verification is failed.

Only in the case when setPermission() or checkPermission() is called, or a Licensed Player is about to activate the Enhanced Title, a Licensed Player shall check if the Permission for that title is activated. The Licensed Player shall not start the playback of the Enhanced Title, unless the Permission for this title is activated.

A Licensed Player which is capable of storing Cacheable Permission shall treat the Cacheable Permission as following;

A Licensed Player shall treat the Cacheable Permission under the rule defined in Enhanced Title Usage for AACS in the associated CPS Unit Usage File. If the current time is out of playable time specified by “Period”, “After” or “Before” fields of Enhanced Title Usage for AACS, a Licensed Player shall not start the playback of the Enhanced Title even if the Title has activated Permission. If all of “Period”, “After” and “Before” are undefined (the values are all zero), a Licensed Player can cache the Permission forever. Note that the Licensed Player shall evaluate “Period”, “After” or “Before” field, when the Licensed Player tries to start the playback of the Enhanced Title. Once the playback of the Enhanced Title started, that Enhanced Title may be continuously played until the player stops the playback of the corresponding Title even if the current time became out of playable time.

Note that the maximum number of Cacheable Permissions to be stored is implementation specific.

A Licensed Player may implement two types of Secure Clock as defined in Section 5.2.1 of the *Introduction and Common Cryptographic Elements* book of this specification. Secure Clock for elapsed time purpose can handle only “Period” and shall ignore “After” and “Before”. On the other hand, Secure Clock for calendar time purpose can handle “Period”, “After” and “Before”. Each type of Secure Clock can handle the Usage Rules as defined in Table 4-1.

Table 4-1 Capability of handling time-based Usage Rules

	Usage Rule: - Period is defined, and - After and/or Before is defined	Usage Rule: - Period is defined - (After and Before are undefined)	Usage Rule: - (Period is undefined) - After and/or Before are defined	Usage Rule: - (Period is undefined) - (After and Before are undefined)
Secure Clock for elapsed time purpose	Can handle (and ignore After and Before field)	Can handle	Cannot handle (and shall handle as Instant Permission)	Can handle
Secure Clock for calendar time purpose	Can handle	Can handle	Can handle	Can handle

(Note 1) For a Licensed Player that has a Secure Clock for calendar time purpose, if either Period or After/Before is in playable time, the title can be played back.

(Note 2) In case storage for Cacheable Permission is not available (i.e. storage is full), a Licensed Player shall

handle Cacheable Permission as Instant Permission.

A Licensed Player shall treat the Instant Permission as following;

In the case of disc ejection or power off, the activated Instant Permission shall be deactivated. Even if the VFS is re-constructed or the instance of the EnablePermission is deleted (e.g. due to garbage collection), the activated Instant Permission shall not be deactivated.

Note that the maximum number of Instant Permissions is the maximum number of Titles (i.e. 999) on the BD-ROM and a Licensed Player shall be capable of storing all the Instant Permissions.

(Note 3) setPermission() can be called even for the Basic Title, and behavior of a Licensed Player (including treatment of Permission) shall be the same as Enhanced Title. If setPermission() is called for the Title which does not exist on the media or Local Storage, a Licensed Player shall return false.

(Note 4) When a PlayList is played back, BD-J Application shall not use setPermission() for the Title that belongs to a different CPS Unit. In other words, both the Title which includes a BD-J Application that uses setPermission() and the Title corresponding to an enablePermission instance to which setPermission() was used shall belong to the same CPS Unit, during PlayList playback.

4.4.1.5.2.3 checkPermission

public boolean **checkPermission** ()

Check activation state of the Permission in AACCS Layer. In addition, if the associated Permission is the Cacheable Permission and the Licensed Player is capable of storing Cacheable Permission, check whether the current time is out of playable time specified by "Period", "After" or "Before" fields of associated Enhanced Title Usage for AACCS.

Returns:

true: the Permission for the Title is active. In addition, if the Permission is Cacheable Permission, the current time is in playable time specified by "Period", "After" or "Before" fields of associated Enhanced Title Usage for AACCS. Note that the Licensed Player that is not capable of storing Cacheable Permission cannot check current time, therefore if the Permission is active, the Licensed Player shall return "true" regardless of current time.

false: the Permission for the Title is not active, the current time is out of playable time specified by "Period", "After" or "Before" fields of associated Enhanced Title Usage for AACCS, or any other error case.

To avoid unexpected results for the consumer, it is strongly recommended that the BD-J Application uses this API before Title transition to ensure activation state of the Permission for the next Title.

4.4.1.5.2.4 isCacheable

public boolean **isCacheable** ()

Check the capability of storing the Cacheable Permission.

Returns:

true: the Licensed Player is capable of storing Cacheable Permission (i.e. a Secure Clock is implemented) and storage for Cacheable Permission is available at that time.

false: the Licensed Player is not capable of storing Cacheable Permission (i.e. a Secure Clock is not implemented) or storage for Cacheable Permission is not available (i.e. storage is full).

A Licensed Player which returns false to isCacheable() method shall treat the Cacheable Permission as Instant Permission when such Licensed Player got Cacheable Permission in the transaction for Enhanced Title.

A Licensed Player which returns true to isCacheable() method shall be capable of treating Cacheable Permission with or without time period in proper manner.

4.5 AACS Media Binding

Types of AACS Media Binding scheme is defined in Section 5.5 of AACS *Introduction and Common Cryptographic Elements* book of this specification. Binding Type of the content is stored in CPS Unit Usage File as defined in Section 3.9.4.4 of this specification.

Since the playback of Media and/or Device Binding Content is supported by only the Licensed Player with AACS On-line capability, it is strongly recommended for BD-J Application to check the player's AACS On-line capability before the title transition to the title which uses Media and/or Device Binding mechanism indicated by Binding Type in Key Management Information for On-line Function.

Note that a player behavior is also implementation specific when a player tries to play Title but MAC of PMSN (or Device Binding Nonce) recorded in CPS Unit Key File on the Binding Unit Data Area is different from the one calculated from CPS Unit Key and current PMSN (or Device Binding Nonce). To avoid unexpected results for the consumer, it is strongly recommended that the BD-J Application checks that PMSN (or Device Binding Nonce) is the expected value by use of getPMSN() defined in Section 4.4.1.2.2.2 (or getDeviceBindingID() defined in Section 4.4.1.3.2.1) of this specification before the title transition to each title which is using Binding scheme with MAC check mechanism. To realize this, for example, Figure 4-4 shows how to check PMSN (or Device Binding Nonce). Here is a sequence of procedure.

1. BD-J Application prepares the expected value of PMSN (or Device Binding Nonce) in Local Storage, which is associated with CPS Unit Key File on the Binding Unit Data Area.
2. BD-J Application requests PMSN (or Device Binding Nonce) to AACS Layer.
3. AACS Layer returns PMSN (or Device Binding Nonce) to BD-J Application.
4. BD-J Application compares PMSN (or Device Binding Nonce) from AACS Layer with the expected value.

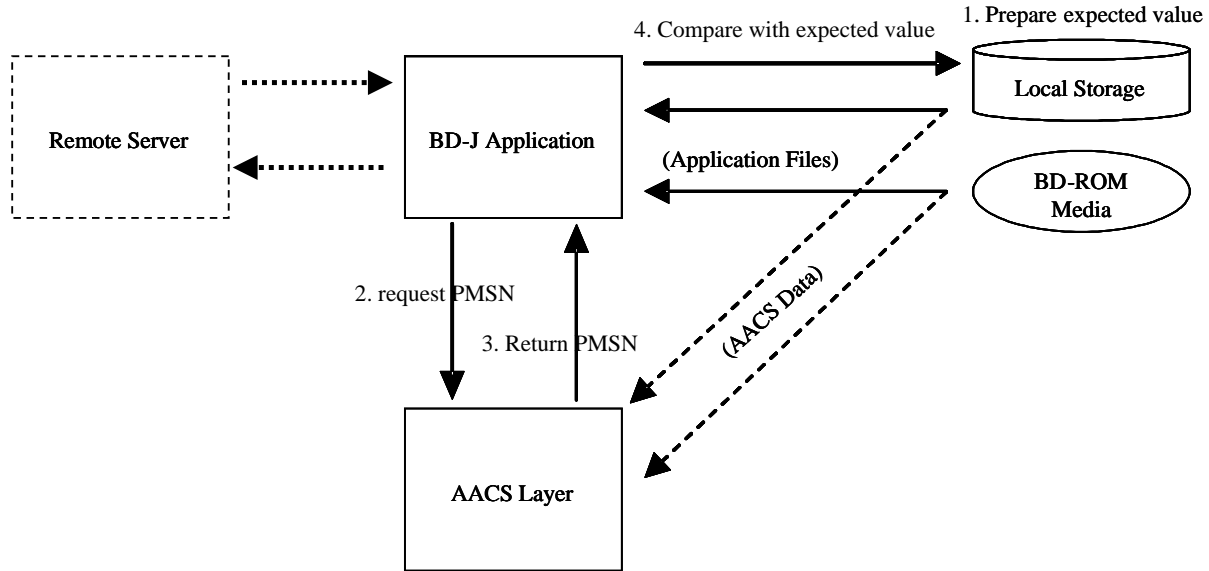


Figure 4-4 How to Check PMSN (or Device Binding Nonce)

The content shall not try to play the titles which do not have playable status in Media and/or Device Binding. The player treats such playback request as an illegal request and shall block the playback of such titles. The player behavior after such an illegal request is implementation dependent.

4.6 Example for the content use with network transaction

4.6.1 Download additional Content

In this example, additional content is downloaded and stored into the Binding Unit Data Area of Local Storage. There are two cases for this example. One case is that the content is added as a new Title, and the other case is that the content is added to the existing Title.

Figure 4-5 shows the directory structure of this example.

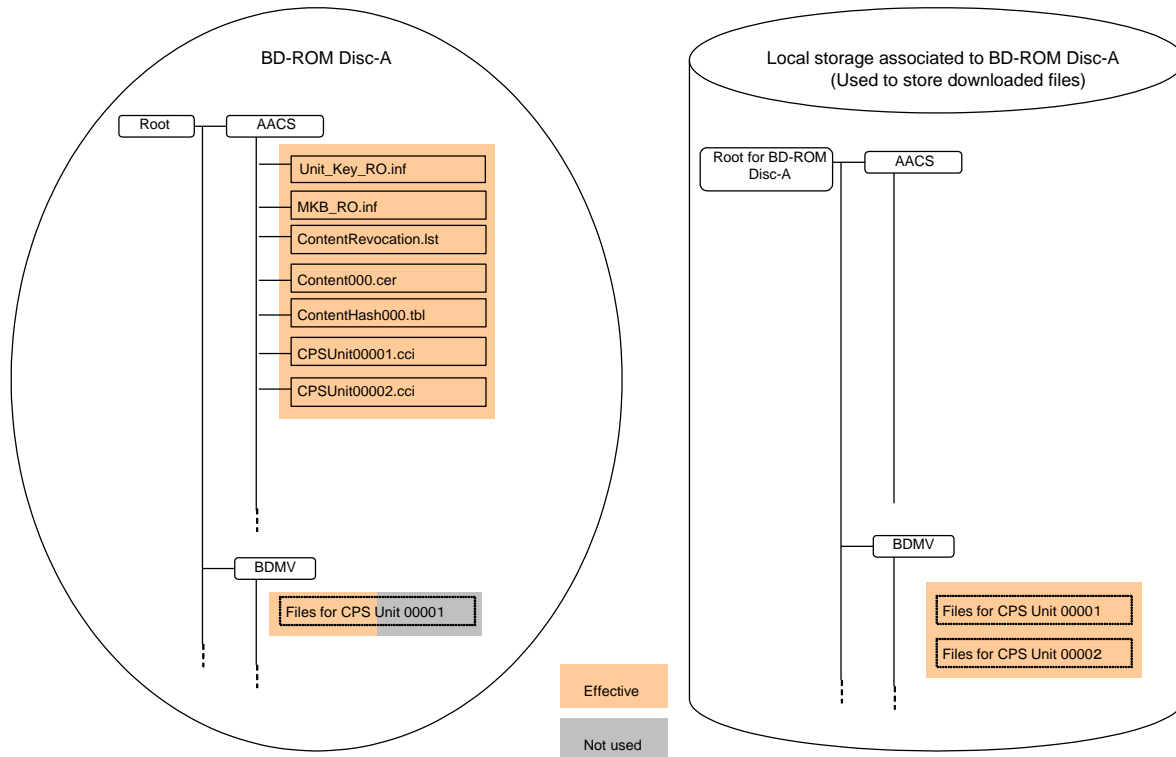


Figure 4-5 Example: Download additional Content

All files under AACS directory are pre-recorded on the media, and there is no download for these files. Files for CPS Unit 00001 are added in this example. Then some files in the media might be overridden by the corresponding files in the Binding Unit Data Area of Local Storage. This case might be useful to update a set of trailers in timely manner.

There are no files for CPS Unit 00002 in the media, and all files are downloaded and stored into the Binding Unit Data Area of Local Storage. This case might be useful to add bonus material after the packaged media are sold.

In both cases, CPS Unit Usage Files and CPS Unit Key File are pre-recorded on the media. The users, who have the media, might be able to receive additional content without charge.

Figure 4-6 shows how to realize this example.

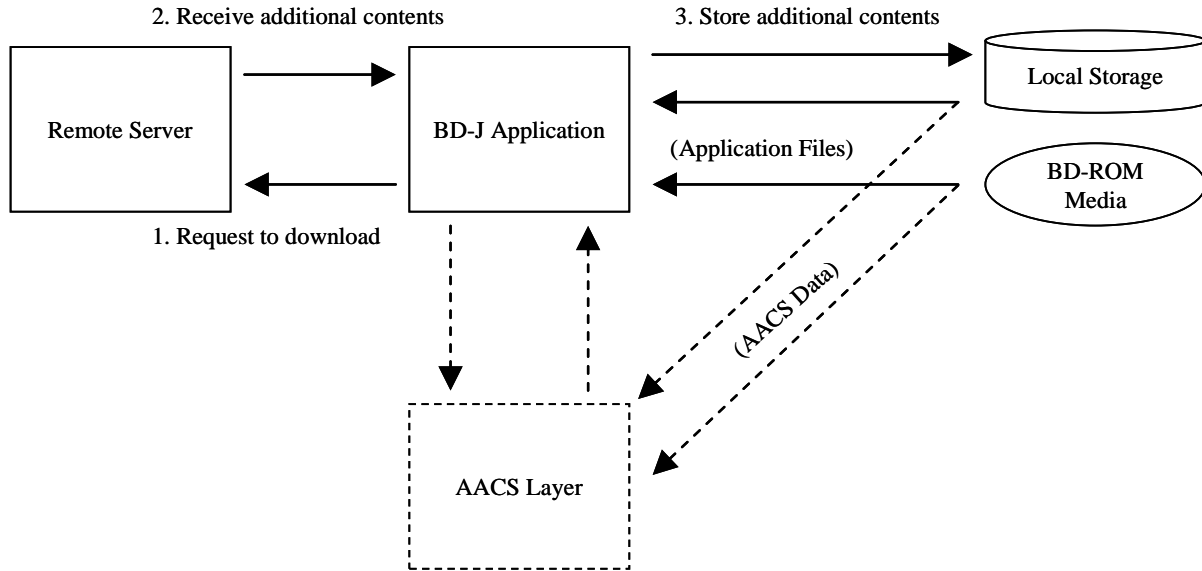
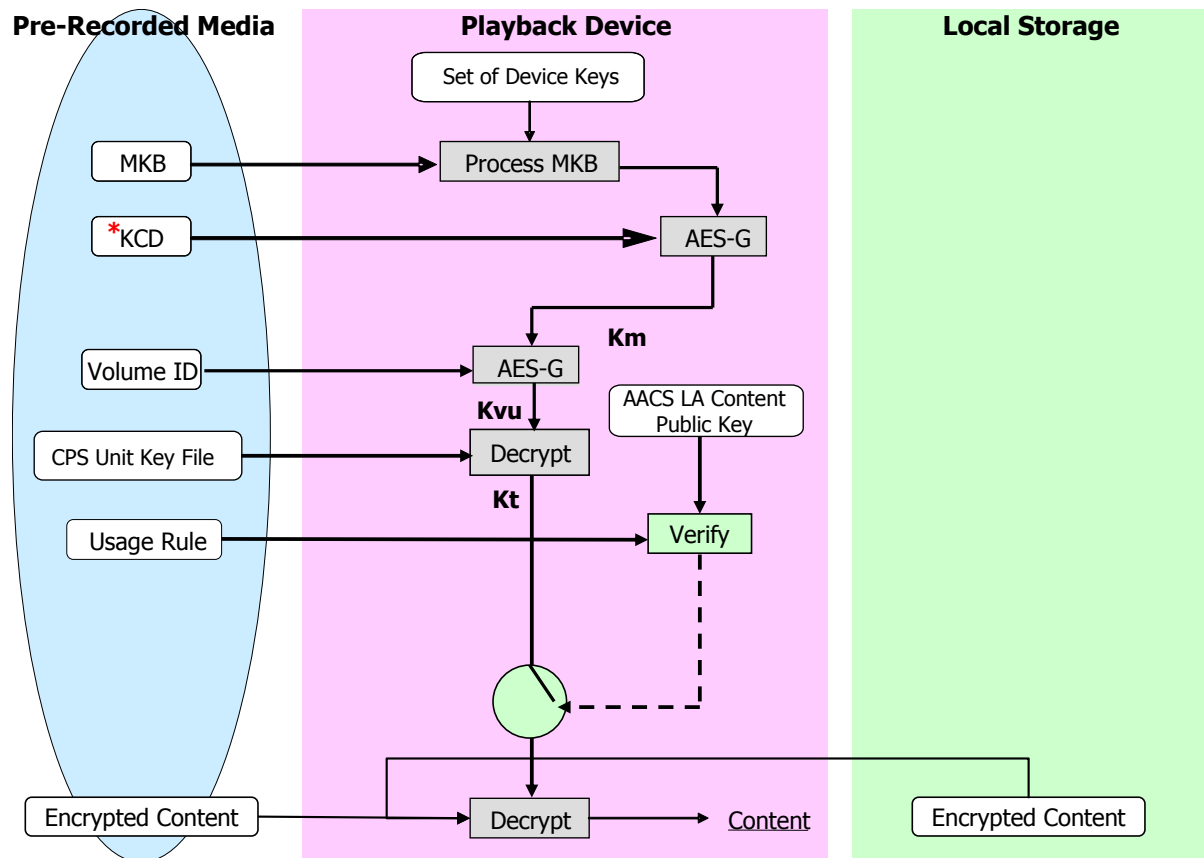


Figure 4-6 How to realize Download additional content

To realize this example, it is not necessary to utilize on-line functionality of the AACS Layer. This example can be realized without the AACS Layer. The BD-J Application requests to download additional content to a Remote Server and stores it into the Binding Unit Data Area of Local Storage.

Of course, after the download process is completed, the AACS Layer is necessary to play the content in both media and the Binding Unit Data Area of Local Storage.

Figure 4-7 describes a decryption overview for the BD-ROM and the Binding Unit Data Area of Local Storage in case of download additional content.



***KCD is used by only certain classes of devices.**

Figure 4-7 Decryption Overview for BD-ROM and Binding Unit Data Area (1)

4.6.2 Download updated Usage Rule

In this example, an updated Usage Rule is downloaded and stored into the Binding Unit Data Area of Local Storage. There are two cases for this: one case is that the binding of the Title Key is still Content Binding, and the other case is that the binding of the Title Key is changed to another type of Binding.

Figure 4-8 shows the directory structure of this example. For both cases, directory structure is identical.

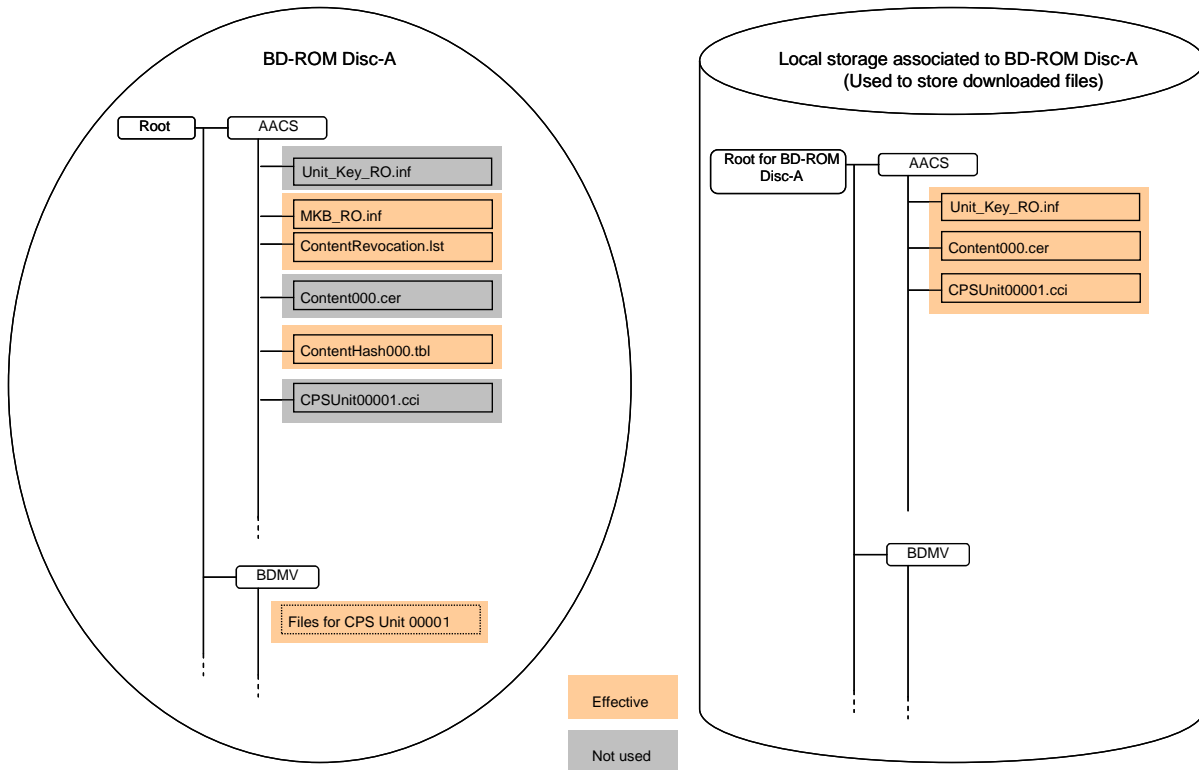


Figure 4-8 Example: Download updated Usage Rule

All files under BDMV directory are pre-recorded on the media, and there is no download for these files. CPS Unit Usage File for CPS Unit 00001 is pre-recorded on the media, and it is updated (overridden) by CPS Unit Usage File for CPS Unit 00001 stored in the Binding Unit Data Area of Local Storage. Related to this, Content Certificate is also updated, because there is a hash of CPS Unit Usage File in this file. When the binding of the CPS Unit Key is changed to another type of Binding, CPS Unit Key File is also updated, because there is a binding information (MAC value) in this file.

For the case that the binding of the CPS Unit Key is still Content Binding, all files (i.e. CPS Unit Usage File, CPS Unit Key File and Content Certificate) are identical for all users. This case might be useful to update usage rules corresponding to a time after the packaged media is released. The users, who have the media, might be able to receive additional content without charge.

For the case that the binding of the CPS Unit Key is changed to another type of binding, CPS Unit Key File is different for each user. This means that the Remote Server shall return a different CPS Unit Key File for each user. This case might be useful to update usage rules based on a charge to each user.

Figure 4-9 shows how to realize this example.

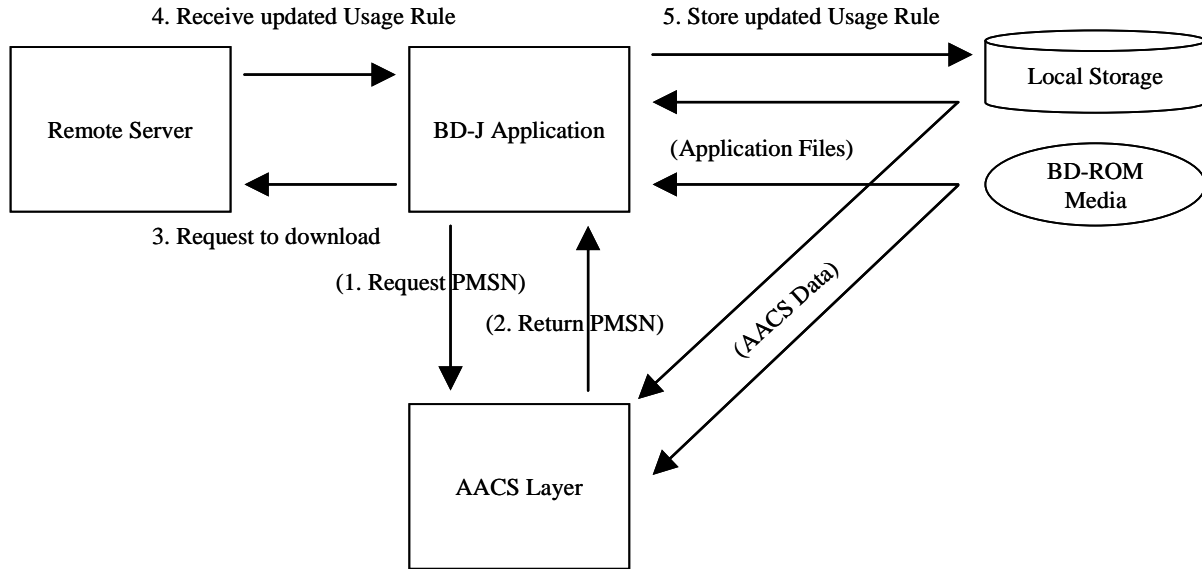
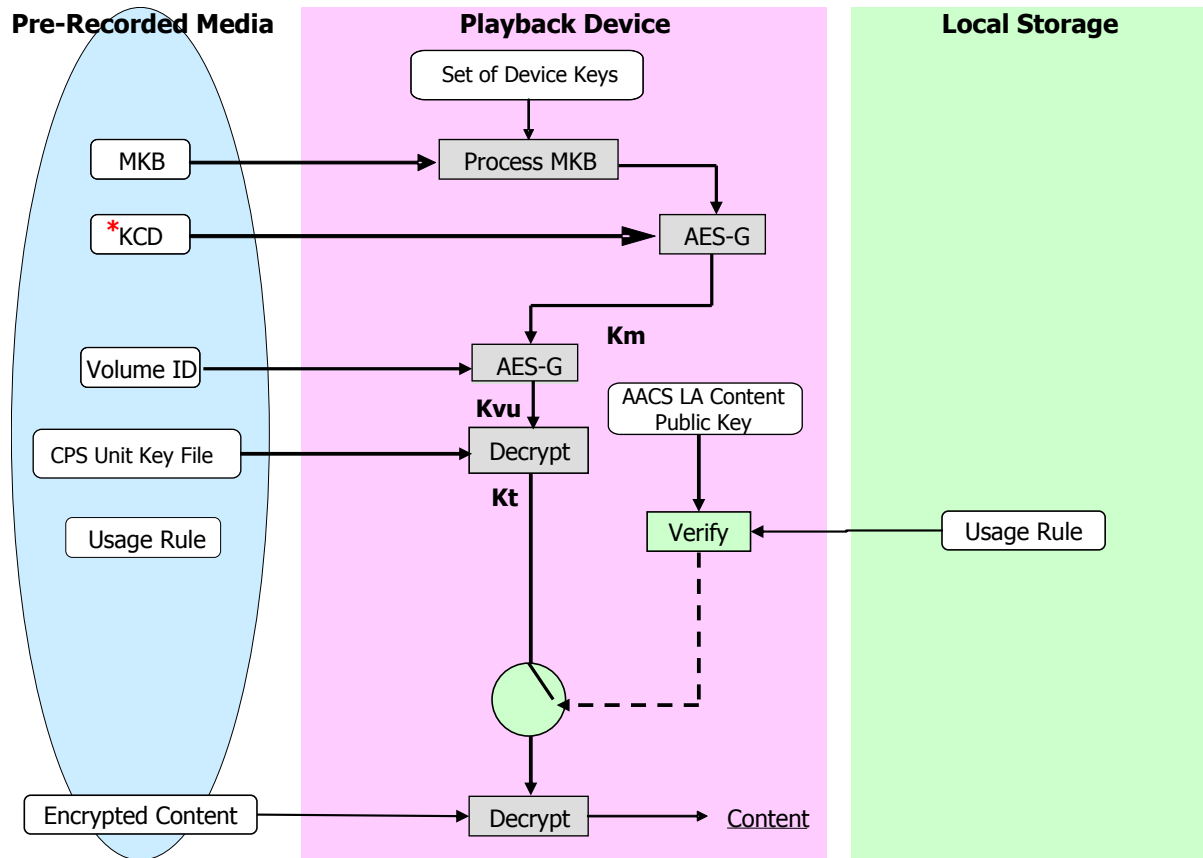


Figure 4-9 How to realize Download updated Usage Rule

To realize the first case of the examples, it is not necessary to utilize on-line functionality of the AACCS Layer. The BD-J Application requests to download an updated Usage Rule to a Remote Server and stores it into the Binding Unit Data Area of Local Storage.

To realize the second case, it is necessary to utilize on-line functionality of the AACCS Layer. Pre-recorded Media Serial Number is required to bind the Title Key to a specific media. Method defined in Section 4.4.1.2.2.2 of this specification is utilized by BD-J for this purpose.

Figure 4-10 describes a decryption overview for the BD-ROM and the Binding Unit Data Area of Local Storage in case of download updated Usage Rule.



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Figure 4-10 Decryption Overview for BD-ROM and Binding Unit Data Area (2)

4.6.3 Download CPS Unit Key

In this example, CPS Unit Key is downloaded and stored into the Binding Unit Data Area of Local Storage. There are two cases for this example. One case is that the binding of the CPS Unit Key is Content Binding, and the second case is that the binding of the CPS Unit Key is not Content Binding.

Figure 4-11 shows the directory structure of this example. For both cases, directory structure is identical.

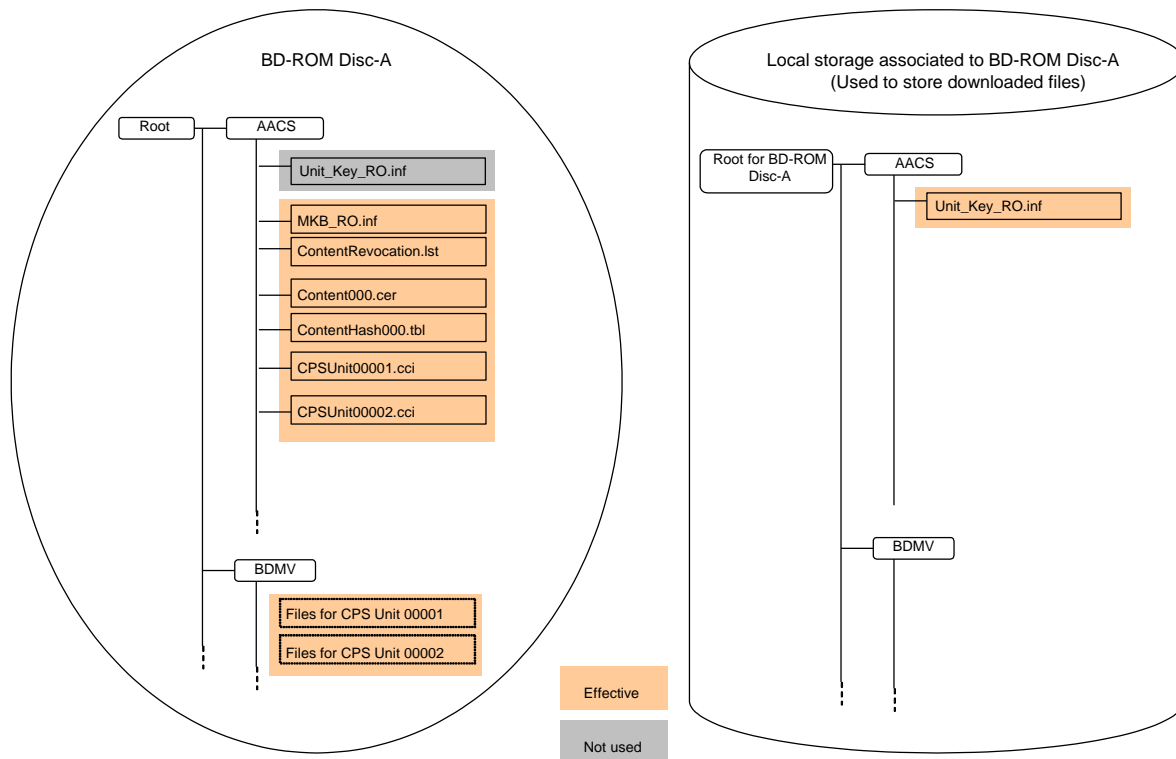


Figure 4-11 Example: Download CPS Unit Key

All files under BDMV directory and AACS directory are pre-recorded on the media, and only one file to be downloaded is CPS Unit Key File. The original CPS Unit Key File on the BD-ROM might have the CPS Unit Key only for CPS Unit 00001. This means that a Title in the CPS Unit 00002 cannot be played back without downloading an updated CPS Unit Key. Downloading a CPS Unit Key File might have a CPS Unit Key for all CPS Units. Then, all Titles in the media can be played back with this downloaded CPS Unit Key File.

For the case that the binding of the CPS Unit Key is Content Binding, this downloaded CPS Unit Key File is identical for all users. This case might be useful to unlock the content in timely manner without charge.

For the case that the binding of the CPS Unit Key is not Content Binding, CPS Unit Key File is different for each user. This means that the Remote Server shall return different CPS Unit Key File for each user. This case might be useful to unlock the content based on the charge to each user.

Figure 4-12 shows how to realize this example.

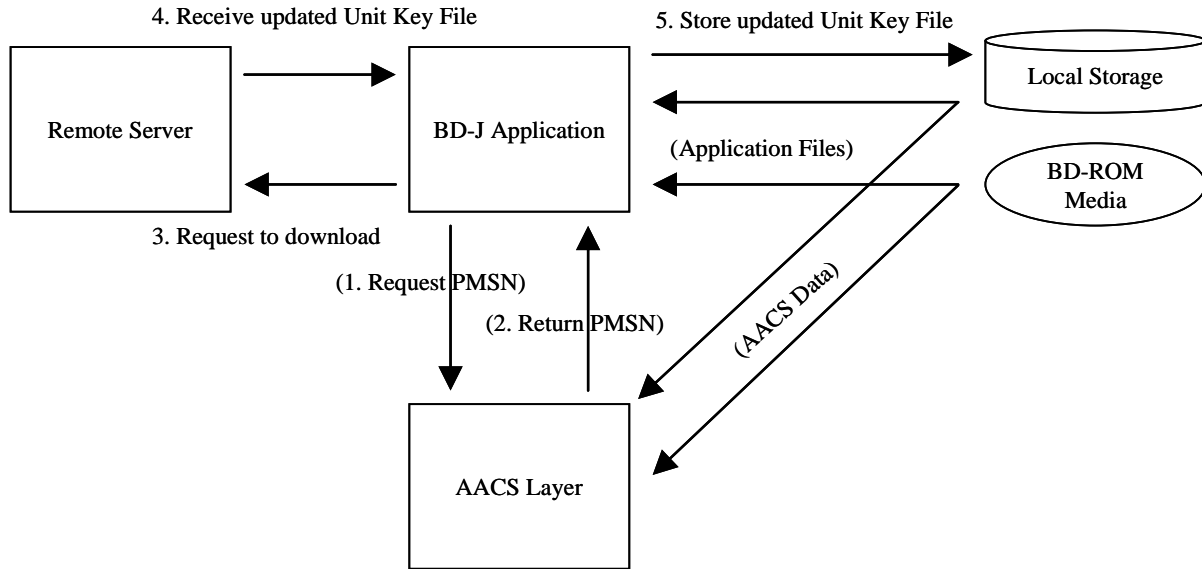
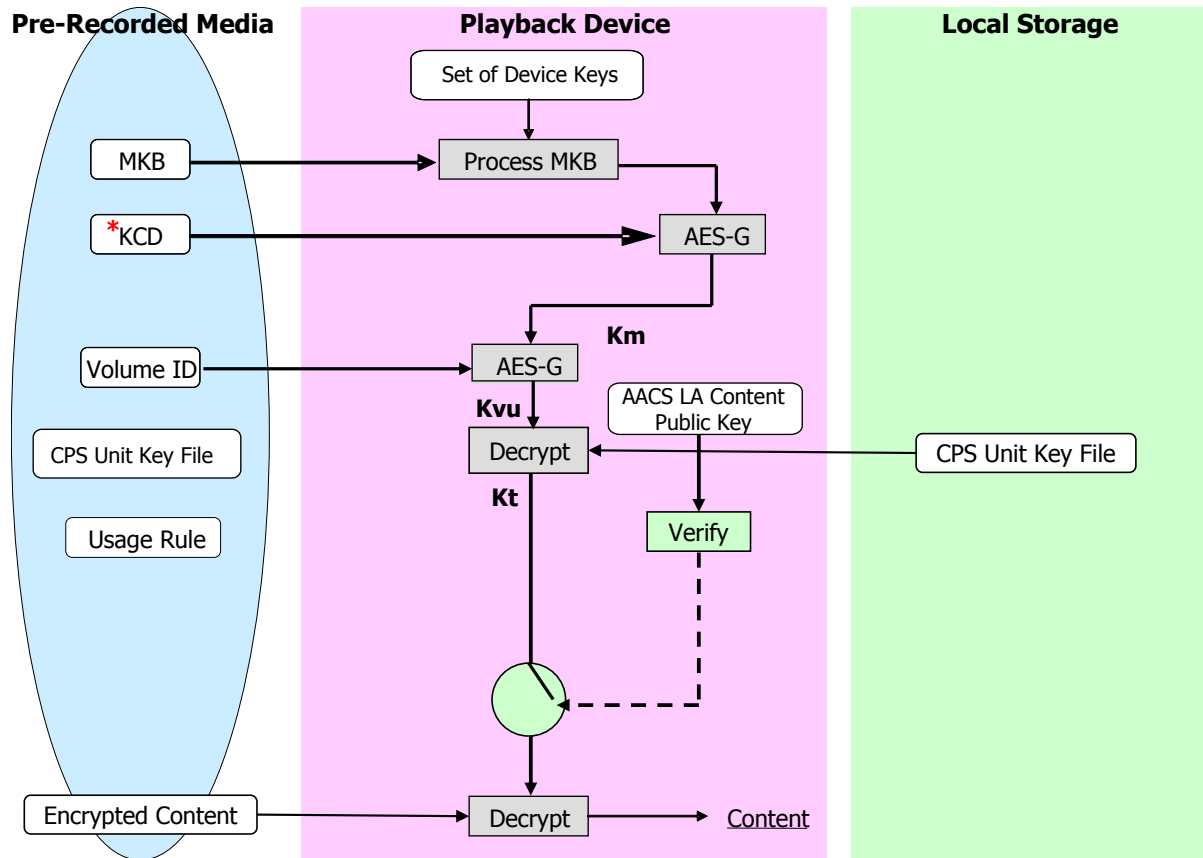


Figure 4-12 How to realize Download Title Key

To realize former case of this example, it is not necessary to utilize on-line functionality of the AACCS Layer. This example can be realized only by BD-J. BD-J Application requests to download an updated CPS Unit Key File to Remote Server and stores it into the Binding Unit Data Area of Local Storage.

To realize the latter case of this example, it is necessary to utilize on-line functionality of the AACCS Layer. A Pre-recorded Media Serial Number is required to bind the CPS Unit Key to a specific media. Method defined in Section 4.4.1.2.2.2 of this specification is utilized by BD-J for this purpose.

Figure 4-13 describes a decryption overview for the BD-ROM and the Binding Unit Data Area of Local Storage in case of download CPS Unit Key.



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Figure 4-13 Decryption Overview for BD-ROM and Binding Unit Data Area (3)

4.6.4 Download Permission

In this example, Permission is downloaded and is stored if Permission is set as Cacheable. Permission may be stored into the Binding Unit Data Area of Local Storage as one example of implementation. Different from other examples, this example does not utilize the concept of VFS.

Figure 4-14 shows how to realize this example.

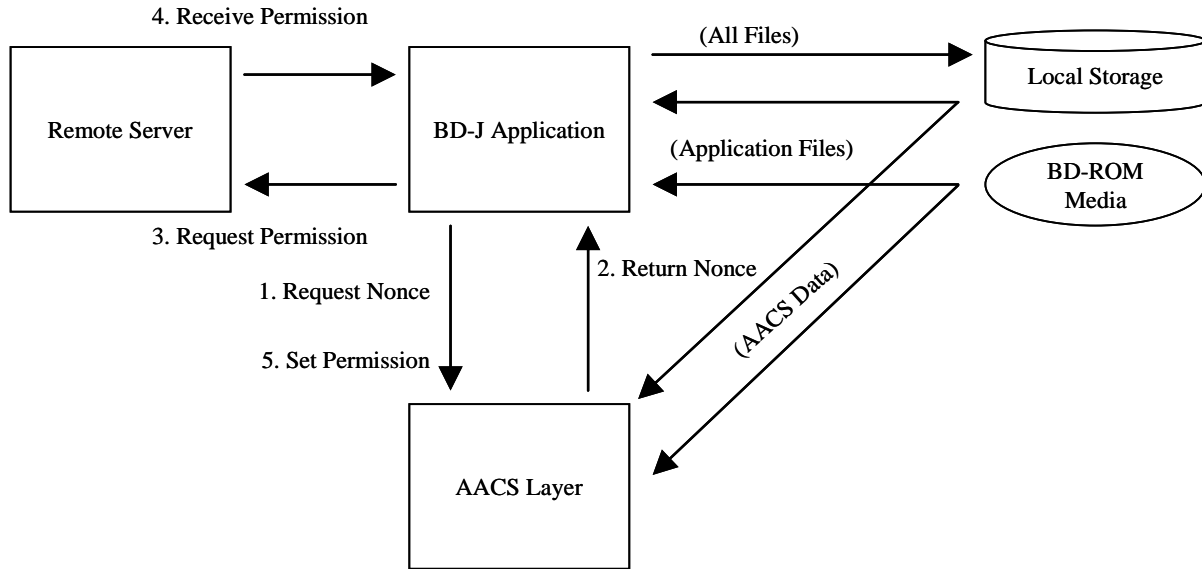


Figure 4-14 How to realize Download Permission

To realize this example, method defined in Section 4.4.1.2.2 and class defined in Section 4.4.1.5 of this specification are utilized by BD-J. Here is a sequence of procedure.

1. Request Volume ID and Nonce
 - BD-J Application creates the instance of the class defined in Section 4.4.1.5 of this specification by use of the constructor defined in Section 4.4.1.5.1.1 of this specification with a specific title_id
 - BD-J Application request to notify Nonce by use of the method defined in Section 4.4.1.5.2.1 of this specification
 - BD-J Application optionally requests to notify Volume ID by use of the method defined in Section 4.4.1.2.2.1 of this specification
 - BD-J Application optionally requests to notify Pre-recorded Media Serial Number by use of the method defined in Section 4.4.1.2.2.2 of this specification
2. Return Volume ID and Nonce
 - AACCS Layer generates random value as Nonce, and store it temporally
 - AACCS Layer retrieves Volume ID and Pre-recorded Media Serial Number from the media
 - BD-J Application receives the responses (Nonce, Volume ID and Pre-recorded Media Serial Number) from AACCS Layer
3. Request Permission
 - BD-J Application sends a request of Permission to Remote Server.
 - At least, Nonce received from AACCS Layer needs to be sent to Remote Server.
 - Optionally, BD-J Application may send the Volume ID and Pre-recorded Media Serial Number, which are received from AACCS Layer.
 - Optionally, BD-J Application may send the title_id, which is described in the BD-J Application itself.
 - Optionally, BD-J Application may send the User ID and password, which is input by the user via the user interface displayed by BD-J Application itself.

- TLS or other proprietary secure authenticated channel may be used for this transaction.
4. Receive Permission
 - BD-J Application receives a Permission from Remote Server
 5. Set Permission
 - BD-J Application sets the received Permission to AACS Layer, then AACS Layer verifies the Permission with temporally stored Nonce
 - AACS Layer is allowed to cache the Permission

BD-J Application shall start the playback of the Title corresponding to the Permission, only once Permission is set into the AACS Layer. Before BD-J Application sends the request of Permission to the Remote Server, BD-J Application is allowed to query the existence of cached Permission to AACS Layer by use of the method defined in Section 4.4.1.5.2.3 of this specification.

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Chapter 5

Managed Copy of Pre-recorded Content

5. Introduction

The information related to the Managed Copy functionality is specified in Chapter 5 of *AACS Pre-recorded Video Book* of this specification. This chapter describes additional definition of interface and structure related to Managed Copy for the use with BD-ROM Media and Application Format.

5.1 System Model

The Managed Copy Machine (MCM) shall either be activated directly as a standalone application or be invoked via the menuing system contained within the BD-J Application on the media to be copied, as Chapter 5 of *AACS Pre-recorded Video Book* of this specification defines. There are three types of implementation for the MCM as follows:

- A) All of the Managed Copy process is performed by a player's resident program (standalone application) activated directly by the user,
- B) All of the Managed Copy process is performed by a player's resident program invoked via the BD-J Application, or
- C) Part of the Managed Copy process (verification, copy) is performed by a player's resident program invoked via the BD-J Application. BD-J Application manages the MCM and performs the transaction with the MCS.

The Licensed Player which supports Managed Copy shall implement at least one type of MCM above. Note that in any type of implementations above, the reading/generation process of AACS data, the verification process and the copying process are performed by AACS Layer of MCM.

For the case that the MCM is activated by the user (Type A MCM), the Managed Copy System based on the AACS and BD-ROM application format consists of two modules, the MCM and Managed Copy Server (MCS). For this type of MCM, a Managed Copy is performed using the Content ID (and the corresponding service). Although the BD-J Application is not used for this type, all APIs defined in Section 5.2 of this book shall still be implemented. Figure 5-1 shows the relation between two modules.

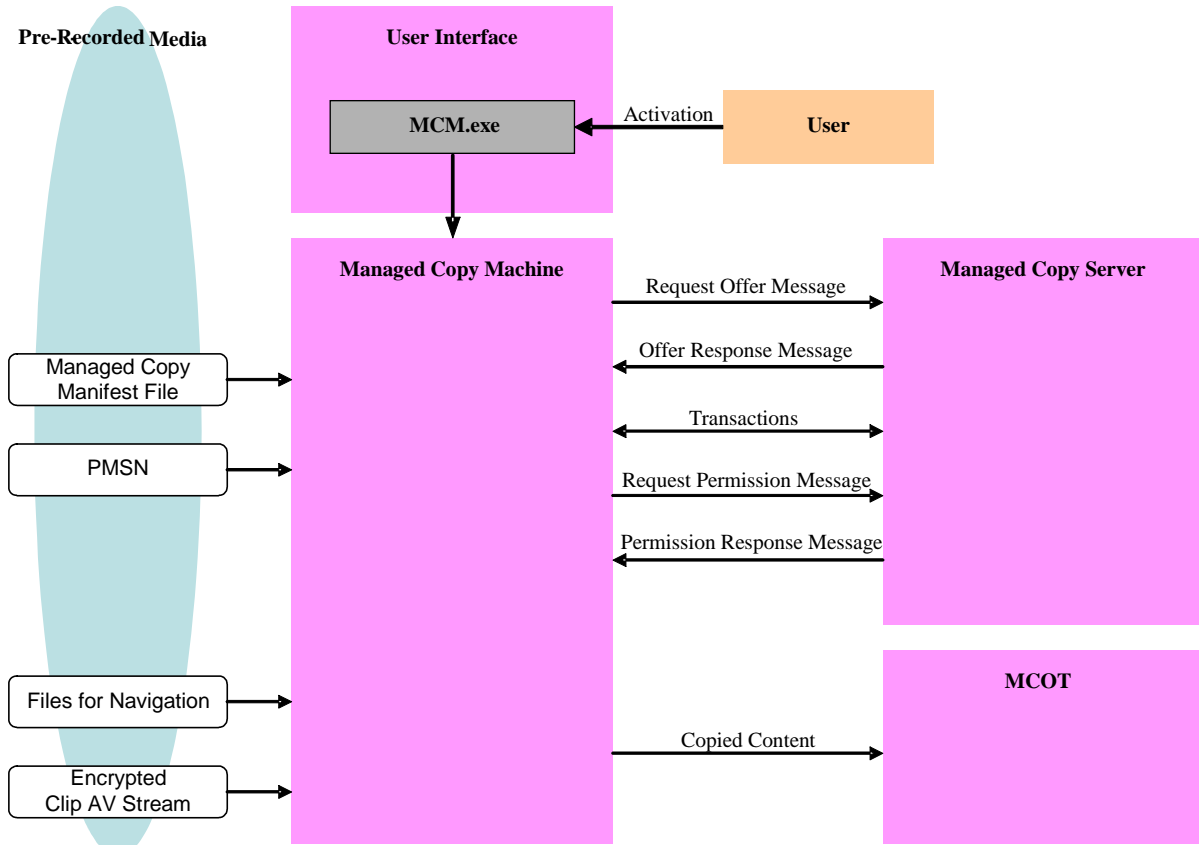


Figure 5-1 Managed Copy System Model: Type A

The Player's resident program (including the user interface) for the MCM controls the entire Managed Copy Process. The Player's resident program (e.g. web browser) performs the financial/account transaction. Note that the user interface for launching the MCM, processing the Offer/Permission and account transaction is player implementation dependent.

For the case that MCM is activated by the BD-J Application (Type B MCM), the Managed Copy System based on the AACS and BD-ROM application format consists of three modules; BD-J Application, MCM and MCS. For this type of MCM, all of the Managed Copy processes are performed by the MCM after the BD-J Application invokes the MCM using APIs defined in Section 5.2 of this book. Although only a few of the APIs will be used for this type, all APIs defined in Section 5.2 of this book shall be implemented. Figure 5-2 shows the relationship among these three modules.

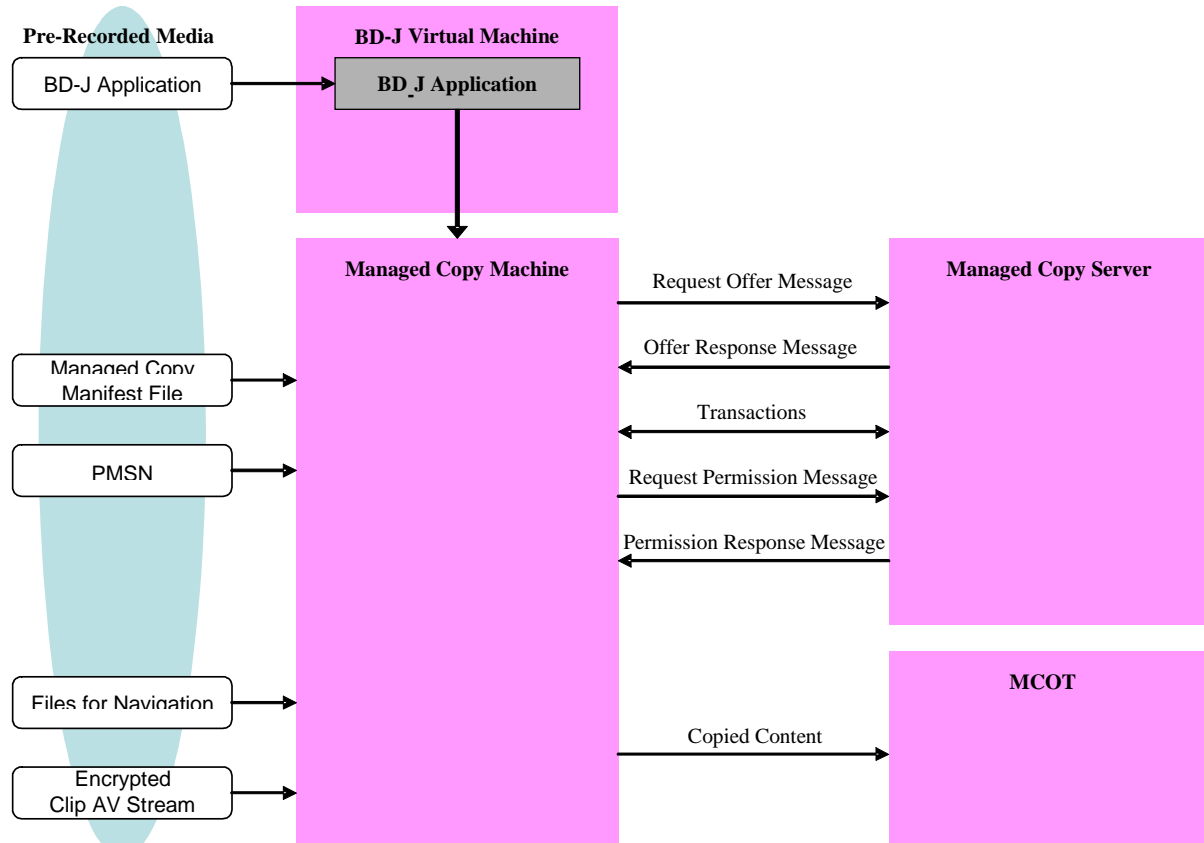


Figure 5-2 Managed Copy System Model: Type B

The APIs used for Type B MCMs are:

- ManagedCopy#getInstance()
- ManagedCopy#InvokeMCM()

See Section 5.2 of this book for the behavior of the rest of the APIs in case that Type B MCM is used.

The user interface for processing the Offer/Permission and account transaction is player implementation dependent.

For the case that the BD-J Application with on-line functionality performs the MCS transaction (Type C MCM), the Managed Copy System based on the AACs and BD-ROM application format consists of three modules; BD-J Application, MCM and MCS. For this type of MCM, the BD-J Application displays the GUI for the Managed Copy process. The BD-J Application also performs the MCS transaction. The MCM's responsibility for this type is solely the verification and copy process. The BD-J Application may also display the progress of the copy process to the user. All APIs defined in Section 5.2 of this book shall be implemented. Figure 5-3 shows the relationship among these three modules.

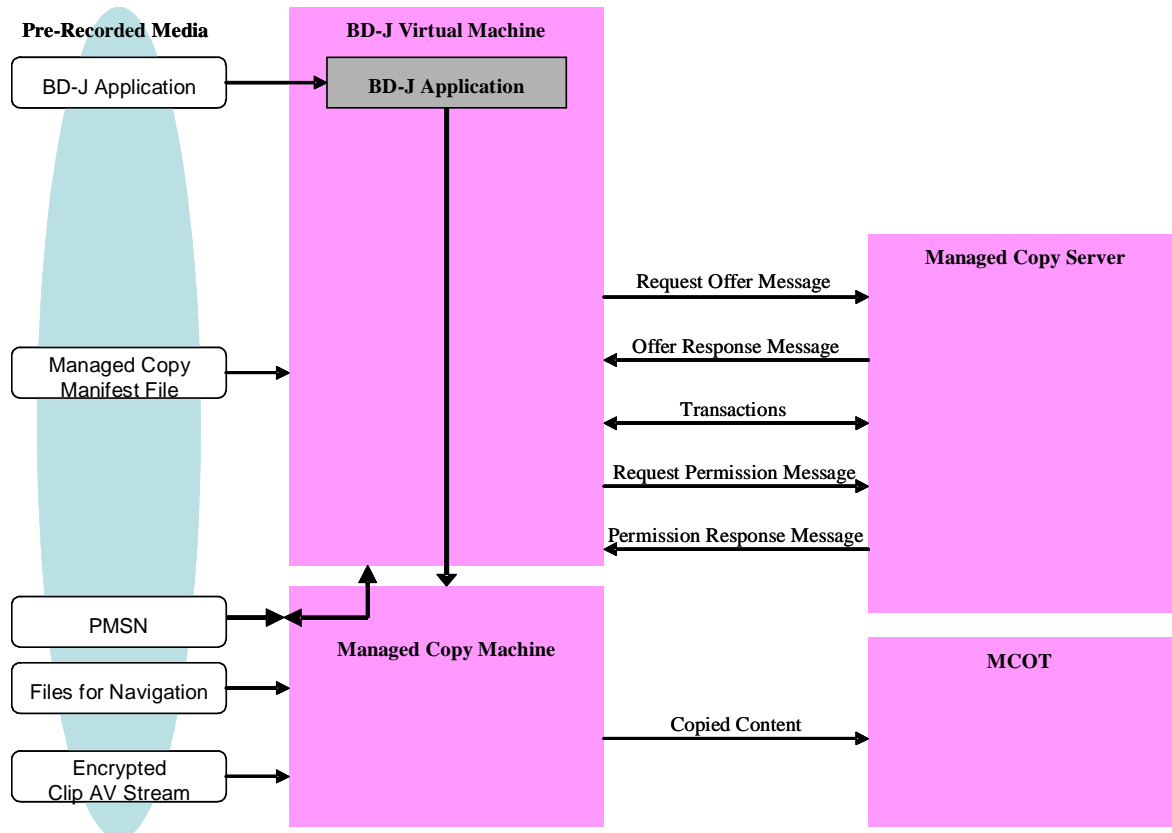


Figure 5-3 Managed Copy System Model: Type C

The BD-J Application controls the behavior of the MCM. The APIs between the Managed Copy Machine and the BD-J Application are defined in Section 5.2 of this book. The BD-J Application can recover the financial/account transaction information from the MCM Recovery Cache if necessary.

Note that all of the BD-J APIs defined in Section 5.2 of this book are required to be implemented in each type of MCM, to avoid the “eager linking”¹ problem.

The roles of the MCM and the MCS and the messages between them are defined in Chapter 5 of the AACPS *Pre-recorded Video Book*. The BD specific versions of the Managed Copy Manifest File, Web service description, Offer Response Message and Permission Response Message are defined in Sections 5.3 and 5.4 of this book. Note that in case that the MCM cannot access the MCS specified in the Managed Copy Manifest File for some reason, the MCM shall access to the Default MCS.

¹ For more detail about the eager linking problem, refer to *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format Part 3: Audio Visual Basic Specifications, Version 2.4, Guidelines*.

5.2 APIs between Managed Copy Machine and BD-J Application

The normative APIs to facilitate the initiation of a Managed Copy are defined in this section. This section provides the list of APIs that BD-J Applications can use to control the MCM. Further requirements and recommendations for Managed Copy API implementation and BD-J Applications are defined in Annex C.

5.2.1 Package `com.aacsla.bluray.mc`

5.2.1.1 Interface Summary

MCEventListener

MCEventListener is an interface for receiving MCEvents.

MCOT

This interface represents a MCOT.

MCPProgress

This interface is used for checking the progress of copy process. ("copy process" means actual data copy triggered by calling `makeCopy()` method).

5.2.1.2 Interface MCEventListener

public interface **MCEventListener**

extends `java.util.EventListener`

MCEventListener is an interface for receiving MCEvents.

5.2.1.2.1 Methods

5.2.1.2.1.1 MCMStatusChanged

public void **MCMStatusChanged**(MCEvent event)

Report that a MCM status is changed.

Parameters:

event - The MCEvent which is generated by MCM.

5.2.1.3 Interface MCOT

public interface **MCOT**

This interface represents a MCOT.

5.2.1.3.1 Methods

5.2.1.3.1.1 `getFreeSpace`

public long **getFreeSpace()**

This method returns the available capacity of this MCOT. If the MCOT is not ready for copy (e.g. not formatted, not inserted, etc...), this method returns -1.

Returns:

The available capacity in bytes.

5.2.1.3.1.2 `getMCMCOTInfo`

public String **getMCMCOTInfo()**

Get the MCM_MCOTInfo from this MCOT. The MCM_MCOTInfo is used for the Request Permission Message. The data format of MCM_MCOTInfo is defined in Section 5.5.8 of the *AACS Pre-recorded Video Book*.

Returns:

a MCM_MCOTInfo

5.2.1.3.1.3 `getMajorMcotId`

public java.lang.String **getMajorMcotId()**

This method returns the major ID of the Managed Copy Output Technology.

Returns:

major ID of the MCOT

5.2.1.3.1.4 `getMinorMcotId`

public java.lang.String **getMinorMcotId()**

This method returns the minor ID of the Managed Copy Output Technology.

Returns:

minor ID of the MCOT. If there is no minor ID, this will return an empty String.

5.2.1.4 Interface `MCTProgress`

public interface **MCTProgress**

This interface is used for checking the progress of the copy process.

5.2.1.4.1 Fields

5.2.1.4.1.1 `COPYING`

public static final int **COPYING** = 1

Returned by getState.

5.2.1.4.1.2 STOPPED

public static final int **STOPPED** = 2

Returned by getState.

5.2.1.4.2 Methods

5.2.1.4.2.1 copied

public long **copied**()

This method returns the already copied bytes on the source media by the current copy process.

Returns:

The data size which has already been copied in bytes.

5.2.1.4.2.2 getState

public int **getState**()

This method returns the current state of the copy process. The possible returned values of states are:

- COPYING
- STOPPED

Returns:

The state of the copy process.

5.2.1.4.2.3 remaining

public long **remaining**()

This method returns the remaining bytes on the source media to be copied by the current copy process.

Returns:

The remaining data size (in bytes) to be copied.

5.2.1.5 Class Summary

ManagedCopy

The ManagedCopy handles ManagedCopy functions required by AACS.

MCCancelEvent

The MCCancelEvent is used to signal that the copy process is canceled.

CompleteTransactionEvent

The CompleteTransactionEvent is used to signal that completeTransaction() is called and granted by the MCM.

MCCompleteEvent

The MCCompleteEvent is used to signal that the copy process is completed by the MCM.

MCErrrorEvent

The MCErrrorEvent is used to signal that the copy process failed because of an error.

MCEvent

MCEvent is a parent class of all event classes which are defined in com.aacsla.bluray.mc package.

MCMAvailableEvent

The MCMAvailableEvent is used to signal that InvokeMCM() is called and AACS MCM module is running.

MCStartEvent

The MCStartEvent is used to signal that makeCopy() is called and the copy process is started.

MCStopEvent

The MCStopEvent is used to signal that the copy process is stopped.

5.2.1.6 Class ManagedCopy

```
java.lang.Object
|
+--com.aacsla.bluray.mc.ManagedCopy
```

```
public class ManagedCopy
```

```
extends java.lang.Object
```

The ManagedCopy handles ManagedCopy functions required by AACS.

5.2.1.6.1 Fields

5.2.1.6.1.1 BDJKEEP_FULL

public static final int **BDJKEEP_FULL** = 1

Returned by getBDJKeepMode().

5.2.1.6.1.2 BDJKEEP_LIMITED

public static final int **BDJKEEP_LIMITED** = 2

Returned by getBDJKeepMode().

5.2.1.6.1.3 BDJKEEP_TERMINATE

public static final int **BDJKEEP_TERMINATE** = 3

Returned by getBDJKeepMode().

5.2.1.6.2 Constructors

5.2.1.6.2.1 Managed Copy

public **ManagedCopy** ()

This method is deprecated. BD-J Applications shall not use this method and shall use getInstance() instead. The Licensed Player shall implement an API stub to return at least a dummy value.

5.2.1.6.3 Methods

5.2.1.6.3.1 IsMCMSupported

public boolean **IsMCMSupported**()

This method is deprecated. BD-J Applications shall not use this method and shall use System.getProperty("aacs.bluray.mc.capability") instead. The Licensed Player shall implement this method.

Returns:

the capability to support MCM function.

true: Managed Copy is supported in the system.

false: Managed Copy is not supported in the system.

5.2.1.6.3.2 InvokeMCM

public void **InvokeMCM**()

A function which invokes a Managed Copy Machine, if one is supported by the implementation.

If the MCM is already in the active state, this method has no effect. If the implementation follows Type B, the BD-ROM Application Environment shall move to the terminated state by this method.

If the MCM is successfully activated, the MCMAvailableEvent will be generated. The BD-J Application shall not use any MCM functions until it receives MCMAvailableEvent.

5.2.1.6.3.3 getInstance

public static ManagedCopy **getInstance**()

throws

MCEException

Returns the instance of the ManagedCopy class.

Returns:

The ManagedCopy object instance.

Throws:

MCEException - Thrown if the implementation only supports Type A or if the implementation does not support the MCM function.

5.2.1.6.3.4 completeTransaction

public void completeTransaction(java.lang.String Coupon,

java.lang.String majorMcotID,

java.lang.String minorMcotID,

java.lang.String mcotOfferInfo,

java.lang.String MCUi,

java.lang.String status,

java.lang.String MCOTParams)

throws

MCEException

Notify the Managed Copy Machine of the completion of the financial transaction. The BD-J Application shall call this API even if there is no financial transaction (i.e. in case of service that does not require a financial transaction). If this method is called twice or more before makeCopy(), only the latest method call is effective. If this method is called during the copy progress or verifyOffers() did not succeed, this method will throw MCEException.

If the completeTransaction succeeds, the MCM shall cache all data to be cached (defined in Section 5.5.1 of this book) into the Recovery Cache. Note that some data may or may not be null. If there is an old data set in the Recovery Cache, the old data set is overwritten by a new data set. Session ID, MCS Certificate, dealManifest and offers which are stored in the MCM temporarily are moved to the Recovery Cache.

Parameters:

Coupon - A string uniquely identifying the financial or account transaction. If there is no such option in the financial transaction, Coupon can be null.

majorMcotID - A string identifier of the major ID of the Managed Copy Output Technology selected for the Managed Copy, as defined in the AACCS License.

minorMcotID - A string identifier of the minor ID of the Managed Copy Output Technology selected for the Managed Copy, as defined in the AACCS License. If there is no minor code, this will be an empty string.

mcotOfferInfo - A base64Binary encoded string which provides MCOT specific information. If there is no value, this will be an empty string.

MCUi - An ID which identifies a particular offer that was selected as a part of the transaction. This value shall be one of the values returned by verifyOffers().

status - an optional string containing further information on the transaction. Informative: For example, if the transaction failed, Status may contain information about why that transaction failed.

MCOTParams - A string value with additional information specific to the Managed Copy Output Technology.

Throws:

MCEException - Thrown if:
completeTransaction failed,
completeTransaction() is called during the copy process,
InvokeMCM() was not called,
MCUi is not one of the values returned by verifyOffers(),
or the verifyOffers() did not succeed.

5.2.1.6.3.5 getDefaultURL

```
public java.net.URL getDefaultURL()
```

throws

MCEException

Get URL of default MCS

Returns:

The URL of default MCS

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.6 getMCOTList

```
public MCOT[] getMCOTList()
```

throws

MCEException

Get the list of MCOTs which are supported by this MCM. If there is no available MCOT, this method returns an array of size zero.

Returns:

The list of MCOTs

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.7 getMCMNonce

public String **getMCMNonce()**

throws

MCEException

Get the Nonce from this MCM

Returns:

The mcmNonce

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.8 getDealManifest

public java.lang.String **getDealManifest()**

throws

MCEException

Get the MCUALL or the MCUPARTIAL corresponding to the offer selected by the user if there is the MCUALL or the MCUPARTIAL in the Recovery Cache. If there is no MCUALL or MCUPARTIAL in the Recovery Cache, null is returned.

Returns:

MCUALL or the MCUPARTIAL corresponding to the offer selected by the user in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.9 getSessionId

public String **getSessionId()**

throws

MCEException

Return the Session ID if there is a Session ID in the Recovery Cache. If there is no Session ID in the Recovery Cache, this method returns null.

Returns:

Session ID in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.10 getCoupon

public java.lang.String **getCoupon()**

throws

MCEException

This method returns the Coupon value selected by completeTransaction() from the Recovery Cache.

If there is no Coupon value in the Recovery Cache, this method returns null.

Returns:

The Coupon in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.11 getMajorMcotId

public java.lang.String **getMajorMcotId()**

throws

MCEException

This method returns the majorMcotID value selected by completeTransaction() from the Recovery Cache.

If there is no majorMcotID value in the Recovery Cache, this method returns null.

Returns:

The majorMcotID in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.12 getMinorMcotId

public java.lang.String **getMinorMcotId()**

throws

MCEException

This method returns the minorMcotID value selected by completeTransaction() from the Recovery Cache.

If there is no minorMcotID value in the Recovery Cache, this method returns null. Note that the minorMcotID may be empty string.

Returns:

The minorMcotID in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.13 getMcotOfferInfo

public java.lang.String **getMcotOfferInfo()**

throws

MCEException

This method returns the mcotOfferInfo value selected by completeTransaction() from the Recovery Cache.

If there is no mcotOfferInfo value in the Recovery Cache, this method returns null. Note that the mcotOfferInfo may be empty string.

Returns:

The mcotOfferInfo in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.14 getMCUi

public java.lang.String **getMCUi()**

throws

MCEException

This method returns the MCUi value selected by completeTransaction() from the Recovery Cache.

If there is no MCUi value in the Recovery Cache, this method returns null.

Returns:

The MCUi in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.15 getStatus

public java.lang.String **getStatus()**

throws

MCEException

This method returns the status value selected by completeTransaction() from the Recovery Cache.

If there is no status value in the Recovery Cache, this method returns null.

Returns:

The status in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.16 getMCOTParams

public java.lang.String **getMCOTParams()**

throws

MCEException

This method returns the MCOTParams value selected by completeTransaction() from the Recovery Cache.

If there is no MCOTParams value in the Recovery Cache, this method returns null.

Returns:

The MCOTParams in the Recovery Cache

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.17 getContentCertID

public byte[] **getContentCertID()**

throws

MCEException

This method returns the ID of Content Certificate, which is stored in the Recovery Cache. If there is no Content Certificate ID in the Recovery Cache, it returns null

Returns:

Content Certificate ID in the Recovery Cache.

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.18 getContentID

public String **getContentID()**

throws

MCEException

This method returns the Content ID, which is stored in the Recovery Cache. If there is no Content ID in the Recovery Cache, it returns null.

Returns:

Content ID stored in the Recovery Cache.

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.19 verifyOffers

public String[] **verifyOffers**(String offers)

throws

MCEException

Verify the MCS Certificate and verify the Signature Data of offers using the MCS Public Key in the MCS Certificate. When the verification succeeds, Session ID, MCS Certificate and offers are stored to the MCM temporarily. In addition, if there is a dealManifest in the offers, the dealManifest is stored to the MCM temporarily. Alternatively, if there is no dealManifest in the offers, all the MCUALL and the MCUPARTIALs included in the Managed Copy Manifest File (mcmf.xml) is stored to the MCM temporarily.

The MCM does not support the offer in the case where the player cannot transcode it in a way specified by offerDetails.

If the mcmNonce in the offers does not match with the value of the AACs layer, the verification will fail.

Parameters:

offers - offers in the Request Offer Response Message

Returns:

List of MCUI values within the Offer Response Message which the MCM supports for copy. Note that the MCM shall not return the MCUI in case the corresponding *withheld* attribute is set to 1. If there is no MCUI which is supported for copy by the MCM, this method returns an array of size zero. If verification fails, this method returns null.

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.20 verifyPermission

public boolean **verifyPermission**(String signature,

String signedcontent)

throws

MCEException

Verify the Signature Data of the Request Permission Response using the MCS Certificate in the Recovery Cache. If the mcmNonce in the Request Permission Response does not match with the value of the AACs layer, the verification will fail. In addition, if the Content ID or the Content Certificate ID of the currently inserted BD-ROM Media does not match with the value in the Recovery Cache or either the Session ID or MCUI in the Request Permission Response does not match with the value in the Recovery Cache, the verification will also fail.

Parameters:

signature - signature value

signedcontent - permissionSignedContent in the Request Permission Response Message

Returns:

true if verification succeeds and all necessary information (as defined in Section 5.5.1 of this book) is in the Recovery Cache. Returns false otherwise.

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.6.3.21 addMCEventListener

public void **addMCEventListener**(MCEventListener listener)

Subscribes the specified MCEventListener to receive events. This method has no effect if the listener was already added.

Parameters:

listener - The MCEventListener to which to send events.

5.2.1.6.3.22 removeMCEventListener

public void **removeMCEventListener**(MCEventListener listener)

Remove a listener to receive events. This method has no effect if the listener was not added before or was already removed earlier.

Parameters:

listener - the listener for MCEvent

5.2.1.6.3.23 makeCopy

public MProgress **makeCopy**()

throws

MCEException

This API outputs the offered data to the selected MCOT. This method is asynchronous. MC applications can check the copy progress via MProgress instance returned by this API. After calling this method, some BD-J functions may be limited, depending on the keep mode supported by this MCM (see getBDJKeepMode()). In the case copying is already in process when this method is called, a MCEException is thrown. After the copy process is successfully completed, data stored in the Recovery Cache is cleared.

Note 1: copy process is cancelled when:

- cancelCopy() is invoked
- UO stop is fired by the user
- source media is ejected

Note 2: copy process may fail when:

- title change occurs

In these cases (Note 1 and Note 2) or case of any other error, the MCM shall stop the copy process and shall delete the Permission. Also, in these cases (Note 1 and Note 2), the BD-J Application shall re-start the Managed Copy process from the Recovery Point to complete the process, if the user requests.

In other words, the BD-J Application shall send Request Permission Message and shall verify the Permission using the `verifyPermission()`.

Returns:

An instance of the `MCPProgress`

Throws:

`MCEException` - thrown

- this API is invoked without `verifyPermission()`.
- this API is invoked when `verifyPermission()` returned false.
- `InvokeMCM()` was not called.
- called during copy progress.

5.2.1.6.3.24 **getOffer**

public String **getOffer()**

throws

`MCEException`

Return the offer.

Returns:

offer which is stored in the Recovery Cache.

Null if there is no offer in the Recovery Cache.

Throws:

`MCEException` - thrown if `InvokeMCM()` was not called.

5.2.1.6.3.25 **cancelCopy**

public boolean **cancelCopy()**

throws

`MCEException`

Cancels the current copy process. If copy process has not yet started or already finished, this method does nothing and just returns false.

If the current copy process is successfully canceled, a `MCCancelEvent` is posted and the partially copied data may be deleted from the MCOT.

Returns:

true if the current copy process is successfully canceled; false otherwise.

Throws:

`MCEException` - Thrown if `InvokeMCM()` was not called.

5.2.1.6.3.26 **getBDJKeepMode**

```
public int getBDJKeepMode()
```

```
    throws
```

```
MCEException
```

This method returns the supported BD-J keep mode by this MCM. After calling makeCopy(), BD-J functions may be limited depending on the keep mode supported by this MCM.

- **BDJKEEP_FULL**: All BD-J Applications can survive after calling makeCopy() without limitations.
- **BDJKEEP_LIMITED**: All BD-J Applications can survive during the copying with following limitations.
 - AV playback is prohibited

BD-J Applications shall close JMF player and stop HSound before calling makeCopy(). BD-J Applications shall not use JMF player and HSound during the copying. If BD-J Applications try to use JMF player or HSound during the copying, the result of these operations is implementation-dependent.
 - Disc I/O access is prohibited

BD-J Application shall not access files on the BD-ROM during the copying. If BD-J Applications try to access files on the BD-ROM during the copying, the result of these operations is implementation-dependent.

The above limitations are released after MCStopEvent is thrown.
- **BDJKEEP_TERMINATE**: BD-ROM Application Environment shall move to terminated state after calling makeCopy().

Returns:

BD-J keep mode that is supported by this MCM.

Throws:

MCEException - Thrown if InvokeMCM() was not called.

5.2.1.7 Class MCCancelEvent

```
java.lang.Object
|
+--java.util.EventObject
    |
    +--com.aacsla.bluray.mc.MCEvent
        |
        +--com.aacsla.bluray.mc.MCStopEvent
            |
            +--com.aacsla.bluray.mc.MCCancelEvent
```

```
public class MCCancelEvent
```

```
    extends MCStopEvent
```

The MCCancelEvent is used to signal that the copy process is canceled.

5.2.1.7.1 Constructors

5.2.1.7.1.1 MCancelEvent

public **MCancelEvent**(java.lang.Object source)

Constructs an event to indicate that the copy process is canceled by cancelCopy().

Parameters:

source - The source object of this event

5.2.1.8 Class CompleteTransactionEvent

```
java.lang.Object
|
+--java.util.EventObject
|
+--com.aacsla.bluray.mc.MCEvent
|
+--com.aacsla.bluray.mc.CompleteTransactionEvent
```

public class **CompleteTransactionEvent**

extends MCEvent

The CompleteTransactionEvent is used to signal that completeTransaction() is called and granted by the MCM

5.2.1.8.1 Constructors

5.2.1.8.1.1 CompleteTransactionEvent

public **CompleteTransactionEvent**(java.lang.Object source)

Constructs an event to indicate the completeTransaction.

This constructor will be used by the control to create the event to be sent to listeners of complete transaction.

Parameters:

source - The source object of this event

5.2.1.9 Class MCCompleteEvent

```
java.lang.Object
|
+--java.util.EventObject
|
+--com.aacsla.bluray.mc.MCEvent
|
+--com.aacsla.bluray.mc.MCStopEvent
|
```

```

+--com.aacsla.bluray.mc.MCCompleteEvent

```

```

public class MCCompleteEvent

```

```

extends MCStopEvent

```

The MCCompleteEvent is used to signal that the copy process is completed.

5.2.1.9.1 Constructors

5.2.1.9.1.1 MCCompleteEvent

```

public MCCompleteEvent(java.lang.Object source)

```

Constructs an event to indicate that the transcoding is completed

Parameters:

source - The source object of this event

5.2.1.10 Class MCErrrorEvent

```

java.lang.Object

```

```

|

```

```

+--java.util.EventObject

```

```

|

```

```

+--com.aacsla.bluray.mc.MCEvent

```

```

|

```

```

+--com.aacsla.bluray.mc.MCStopEvent

```

```

|

```

```

+--com.aacsla.bluray.mc.MCErrrorEvent

```

```

public class MCErrrorEvent

```

```

extends MCStopEvent

```

The MCErrrorEvent is used to signal that the copy process has failed because of an error.

5.2.1.10.1 Constructors

5.2.1.10.1.1 MCErrrorEvent

```

public MCErrrorEvent(java.lang.Object source)

```

Constructs an event to indicate that the copy process has failed because of an error

Parameters:

source - The source object of this event

5.2.1.11 Class MCEvent

```
java.lang.Object
|
+--java.util.EventObject
|
+--com.aacsla.bluray.mc.MCEvent
```

public class **MCEvent**

extends java.util.EventObject

MCEvent is a parent class of all event classes which are defined in com.aacsla.bluray.mc package.

5.2.1.11.1 Constructors

5.2.1.11.1.1 MCEvent

public **MCEvent**(java.lang.Object source)

Construct this event

Parameters:

source - The source object of this event

5.2.1.12 Class MCMAvailableEvent

```
java.lang.Object
|
+--java.util.EventObject
|
+--com.aacsla.bluray.mc.MCEvent
|
+--com.aacsla.bluray.mc.MCMAvailableEvent
```

public class **MCMAvailableEvent**

extends MCEvent

The MCMAvailableEvent is used to signal that InvokeMCM() was called and the AACS MCM module is running.

5.2.1.12.1 Constructors

5.2.1.12.1.1 MCMAvailableEvent

public **MCMAvailableEvent**(java.lang.Object source)

Construct this event

Parameters:

source - The source object of this event

5.2.1.13 Class MCStartEvent

```

java.lang.Object
|
+--java.util.EventObject
    |
    +--com.aacsla.bluray.mc.MCEvent
        |
        +--com.aacsla.bluray.mc.MCStartEvent
  
```

public class **MCStartEvent**

extends MCEvent

The MCStartEvent is used to signal that makeCopy() has been called and the copy process is started.

5.2.1.13.1 Constructors

5.2.1.13.1.1 MCStartEvent

public **MCStartEvent**(java.lang.Object source)

Constructs an event to indicate the starting of the copy process.

Parameters:

source - The source object of this event

5.2.1.14 Class MCStopEvent

```

java.lang.Object
|
+--java.util.EventObject
    |
    +--com.aacsla.bluray.mc.MCEvent
        |
        +--com.aacsla.bluray.mc.MCStopEvent
  
```

public class **MCStopEvent**

extends MCEvent

The MCStopEvent is used to signal that the copy process is stopped.

5.2.1.14.1 Constructors

5.2.1.14.1.1 MCStopEvent

public **MCStopEvent**(java.lang.Object source)

Constructs an event to indicate that the copy process is stopped

Parameters:

source - The source object of this event

5.2.1.15 Exception Summary

MCEException

This exception indicates that an exception of the ManagedCopy has been thrown.

5.2.1.16 Class MCEException

```
java.lang.Object
|
+--java.lang.Throwable
|
+--java.lang.Exception
|
+--com.aacsla.bluray.mc.MCEException
```

```
public class MCEException
```

```
extends java.lang.Exception
```

This exception indicates that an exception of the ManagedCopy has been thrown.

5.2.1.16.1 Constructors

5.2.1.16.1.1 MCEException

```
public MCEException()
```

Constructs a MCEException.

5.2.1.16.1.2 MCEException

```
public MCEException(java.lang.String reason)
```

Constructs a MCEException with a detail message.

Parameters:

reason - The reason to raise this exception.

5.3 Managed Copy Manifest File

The Managed Copy Manifest File “mcmf.xml” holds various data that are used for Managed Copy. It is recommended that the Managed Copy Manifest File be stored on the BD-ROM disc if the BD-ROM disc is made ready for Managed Copy. If the Managed Copy Manifest File is stored on the BD-ROM disc, it shall be

stored in the “\AACS” directory and in the “\AACS\DUPLICATE” directory, and the size of the File shall be less than or equal to 768 K bytes.

The Managed Copy Manifest File holds the following data for Managed Copy:

- ◆ URIs of Managed Copy Servers
- ◆ Content ID
- ◆ Copy Unit, a collection of Managed Copy Units including MCU All and MCU Partial. Each MCU Partial holds one or more pairs of the title_number and the PlayList file name with which the MCM can identify necessary files to process the Managed Copy for each Managed Copy Unit (MCU).
The **title_number** is defined in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications* and is used to identify the CPS Unit Key for the Clip AV stream file(s) to be copied.
The **PlayList file name** is used to identify the Clip AV stream file(s) to be copied.

Note that Content Providers and Content Participants are required to offer and authorize the making of Managed Copies under the AACS Final Content Provider Agreement or Final Content Participant Agreement as applicable, with certain exceptions set forth in such Agreements. To offer the making of Managed Copies, the ROM disc shall be made ready for Managed Copy. Requirements for Managed Copy-ready BD-ROM disc are described in Section 5.6 of this specification.

In addition, Content Providers and Content Participants are required to manage the Content ID or the Content Certificate ID and to provide such ID to MCS. They may manage and provide both IDs. The Content ID and/or the Content Certificate ID shall be stored in MCS database together with corresponding Offers. In the case a valid Content ID is not stored on the BD-ROM disc, the Content Certificate ID is the only key to identify Offers. Therefore, Content Providers and Content Participants should be aware that they have to manage the Content Certificate ID in the Content Certificate that is issued by AACS usually during the mastering process.

The following XML description is an example of Managed Copy Manifest File. This example includes one MCUALL and one MCUPARTIAL that has two PlayLists.

```
<?xml version="1.0" encoding="UTF-8"?>
<mcmfManifest xmlns="http://www.aacsla.com/2006/02/bdmcManifest"
xmlns:mc="http://www.aacsla.com/2006/02/bdmcManifest"
contentID="0x80000000000000000000000000000001">
  <mc:URIList>
    <mc:URI>http://example.com/ManagedCopy/00000001/</mc:URI>
    <mc:URI>http://example.net/ManagedCopy/00000001/</mc:URI>
  </mc:URIList>
  <mc:CopyUnit>
    <mc:MCUALL MCUi="ALL_000"/>
    <mc:MCUPARTIAL MCUi="PARTIAL_100">
      <mc:PlayListInfo>
        <mc:title_number>1</mc:title_number>
        <mc:PlayListFileName>BDMV/PLAYLIST/00030.mpls
        </mc:PlayListFileName>
        <mc:title>Movie10</mc:title>
      </mc:PlayListInfo>
      <mc:PlayListInfo>
        <mc:title_number>5</mc:title_number>
        <mc:PlayListFileName>BDMV/PLAYLIST/00070.mpls
        </mc:PlayListFileName>
        <mc:title>TRAILER</mc:title>
      </mc:PlayListInfo>
    </mc:MCUPARTIAL>
  </mc:CopyUnit>
</mcmfManifest>
```

```

        </mc:PlayListInfo>
    </mc:MCUPARTIAL>
</mc:CopyUnit>
</mcmfManifest>

```

5.3.1 XML schema of Managed Copy Manifest File

The Managed Copy Manifest File is an XML File.

The Managed Copy Manifest File XML Schema is defined as follows.

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.aacsla.com/2006/02/bdmcManifest"
  xmlns:bdmcmf="http://www.aacsla.com/2006/02/bdmcManifest"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xs:element name="mcmfManifest">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="bdmcmf:URIList"
          minOccurs="0" maxOccurs="1" />
        <xs:element ref="bdmcmf:CopyUnit" minOccurs="0"
          maxOccurs="1" />
        <xs:element ref="bdmcmf:MCUALL"
          minOccurs="0" maxOccurs="1" />
        <xs:element ref="bdmcmf:MCUPARTIAL"
          minOccurs="0" maxOccurs="unbounded" />
      </xs:sequence>
      <xs:attribute name="contentID"
        type="bdmcmf:contentIDType" use="optional" />
    </xs:complexType>
  </xs:element>
  <xs:element name="URIList">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="URI"
          minOccurs="0" maxOccurs="16">
          <xs:simpleType>
            <xs:restriction base="xs:anyURI">
              <xs:maxLength value="1024"/>
            </xs:restriction>
          </xs:simpleType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>

```

```

        </xs:simpleType>
    </xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="CopyUnit">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="MCUALL" minOccurs="0"
maxOccurs="256">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="age"
                                minOccurs="0" maxOccurs="1"
type="bdmcmf:ageType"
/>
                        <xs:element name="three_d_only"
                                maxOccurs="1" />
                        <xs:element
                                minOccurs="0" maxOccurs="1"
name="three_d_full_frame_only"
/>
                    </xs:sequence>
                    <xs:attribute name="MCUi"
type="xs:string" use="required" />
                </xs:complexType>
            </xs:element>
            <xs:element name="MCUPARTIAL" minOccurs="0"
maxOccurs="256">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element name="age"
                                minOccurs="0" maxOccurs="1"
type="bdmcmf:ageType"
/>
                        <xs:element name="three_d_only"
                                maxOccurs="1" />
                        <xs:element
                                minOccurs="0" maxOccurs="1"
name="three_d_full_frame_only"
/>
                        <xs:element name="PlayListInfo"
                                minOccurs="1"
type="bdmcmf:PlayListInfoType"
maxOccurs="32" />
                    </xs:sequence>
                    <xs:attribute name="MCUi"
type="xs:string" use="required" />
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>

```

```

</xs:element>
<xs:element name="MCUALL">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="DirectoryName" minOccurs="0"
        maxOccurs="unbounded">
        <xs:complexType>
          <xs:simpleContent>
            <xs:extension
              base="bdmcmf:fileNameType">
                <xs:attribute name="dest"
                  type="bdmcmf:fileName
                    Type" use="optional" />
              </xs:extension>
            </xs:simpleContent>
          </xs:complexType>
        </xs:element>
        <xs:element name="description"
          type="bdmcmf:descriptionType" minOccurs="0"
          maxOccurs="64"/>
        <xs:element name="thumbnail" minOccurs="0"
          maxOccurs="1">
          <xs:complexType>
            <xs:simpleContent>
              <xs:extension base="xs:string">
                <xs:attribute name="href">
                  <xs:simpleType>
                    <xs:restriction
                      base="xs:anyURI">

```

```

<xs:maxLength value="256" />

```

```

</xs:restriction>

```

```

</xs:simpleType>

```

```

</xs:attribute>

```

```

<xs:attribute name="size"
  type="bdmcmf:thumbSize"
  use="required" />

```

```

</xs:extension>

```

```

</xs:simpleContent>

```

```

</xs:complexType>

```

```

        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="MCUPARTIAL">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="FileName"
          minOccurs="0" maxOccurs="unbounded">
          <xs:complexType>
            <xs:simpleContent>
              <xs:extension
                base="bdmcmf:fileNameType">
                <xs:attribute name="dest"
type="bdmcmf:fileNameType" use="optional" />
              </xs:extension>
            </xs:simpleContent>
          </xs:complexType>
        </xs:element>
        <xs:element name="description"
          type="bdmcmf:descriptionType" minOccurs="0"
          maxOccurs="64" />
        <xs:element name="thumbnail" minOccurs="0"
          maxOccurs="1">
          <xs:complexType>
            <xs:simpleContent>
              <xs:extension base="xs:string">
                <xs:attribute name="href">
                  <xs:simpleType>
                    <xs:restriction
base="xs:anyURI">
                    <xs:maxLength value="256"/>
                  </xs:restriction>
                </xs:simpleType>
              </xs:attribute>
            <xs:attribute name="size"

```

```

type="bdmcmf:thumbSize" use="required" />
        </xs:extension>
    </xs:simpleContent>
</xs:complexType>
</xs:element>
</xs:sequence>
<xs:attribute name="ID"
    type="bdmcmf:IDType" use="required"/>
</xs:complexType>
</xs:element>
<xs:simpleType name="IDType" final="restriction">
    <xs:restriction base="xs:string">
        <xs:pattern value="(0x([0-9]|[a-f]|[A-F]))+"/>
        <xs:length value="6" fixed="true"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="contentIDType" final="restriction">
    <xs:restriction base="xs:string">
        <xs:pattern value="(0x([0-9]|[a-f]|[A-F]))+"/>
        <xs:maxLength value="34" fixed="true"/>
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="descriptionType">
    <xs:attribute name="lang" type="xs:string"/>
    <xs:attribute name="text" type="xs:string"/>
</xs:complexType>
<xs:simpleType name="fileNameType">
    <xs:restriction base="xs:string">
        <xs:maxLength value="1024"/>
    </xs:restriction>
</xs:simpleType>
<xs:simpleType name="thumbSize">
    <xs:restriction base="xs:string">
        <xs:pattern value="320x240|416x240|480x360|640x360" />
    </xs:restriction>
</xs:simpleType>
<xs:complexType name="selectionType">

```

```

<xs:simpleContent>
  <xs:extension base="xs:string">
    <xs:attribute name="audio">
      <xs:simpleType>
        <xs:restriction base="xs:integer">
          <xs:minInclusive value="-1" />
          <xs:maxInclusive value="32" />
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="subtitle">
      <xs:simpleType>
        <xs:restriction base="xs:integer">
          <xs:minInclusive value="-1" />
          <xs:maxInclusive value="255" />
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="angle">
      <xs:simpleType>
        <xs:restriction base="xs:integer">
          <xs:minInclusive value="-1" />
          <xs:maxInclusive value="9" />
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="angleInfo">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:maxLength value="256" />
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:extension>
</xs:simpleContent>
</xs:complexType>
<xs:simpleType name="PlayListFileNameType">
  <xs:restriction base="xs:string">
    <xs:pattern value="(BDMV/PLAYLIST/\d{5}\.mpls)" />
  </xs:restriction>
</xs:simpleType>
<xs:complexType name="PlayListInfoType">
  <xs:sequence>
    <xs:element name="title_number"
type="xs:nonNegativeInteger"
      minOccurs="1" maxOccurs="1" />
    <xs:element name="PlayListFileName" minOccurs="1"
maxOccurs="1">
      <xs:complexType>
        <xs:simpleContent>
          <xs:extension
base="bdmcmf:PlayListFileNameType">
            <xs:attribute name="dest"
type="bdmcmf:fileNameType"
              use="optional" />
          </xs:extension>
        </xs:simpleContent>

```

```

        </xs:complexType>
      </xs:element>
      <xs:element name="title" type="bdmcmf:textType"
minOccurs="0"
        maxOccurs="1" />
      <xs:element name="description"
type="bdmcmf:descriptionType"
        minOccurs="0" maxOccurs="64" />
      <xs:element name="selection" type="bdmcmf:selectionType"
        minOccurs="0" maxOccurs="1" />
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="textType">
    <xs:restriction base="xs:string">
      <xs:maxLength value="1024" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="ageType">
    <xs:restriction base="xs:integer">
      <xs:minInclusive value="0" />
      <xs:maxInclusive value="255" />
    </xs:restriction>
  </xs:simpleType>
</xs:schema>

```

5.3.1.1 Definition/Usage of Managed Copy Manifest File

This section describes definition and usage of elements in the Managed Copy Manifest File.

◆ URIList:

- The *URIList* may include one or more URIs of the MCS. The MCM shall start the Managed Copy process with the first URI in the *URIList* element. If the process fails, the MCM may use the next URI.
- In case that the URL of MCS (*URIList* element) is not listed in the Managed Copy Manifest File or the Managed Copy Manifest File is not on the BD-ROM, the MCM can start the Managed Copy process by accessing the Default MCS.

◆ CopyUnit:

- The *CopyUnit* includes one or more sets of Managed Copy Unit (*MCUALL* and/or *MCUPARTIAL*).
- **MCUALL / MCUPARTIAL:**
 - ✧ For detailed use of *MCUALL* and *MCUPARTIAL*, refer to Section 5.4.2.2 of this specification. The other fields in the *CopyUnit* are described as follows:
 - ✧ **MCUi:**
 - The *MCUi* is a string to identify *MCUALL* or *MCUPARTIAL*, and shall have the same string as *MCUi* under the corresponding *offer* element in the Offer Response Message. This means that if the user chooses an offer, the MCM can identify the corresponding *MCUALL* or *MCUPARTIAL* using *MCUi*.
 - ✧ **age:**
 - The *age* element may be optionally listed, and if the MCM finds this element it shall use this element for age based parental control. The MCM can find a player setting of Parental

Level in PSR13 as defined in *Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications*. The MCM shall not make a copy if the corresponding Managed Copy Unit (*MCUALL* or *MCUPARTIAL*) has the value of the *age* element equal to or more than Parental Level in PSR13. After the copy is made, the MCOT shall apply its parental control rule when the copy is played if the MCOT has such rule. If the MCM is not associated with a player, it must either support an equivalent parental control setting internally, or it must guarantee that equivalent parental control will be enforced during playback of Managed Copy content.

✧ **three_d_only:**

- The *three_d_only* element may be optionally listed, and if the MCM finds this element, it shall not make a 2D copy of the 3D video content included in the corresponding Managed Copy Unit.
- If the *three_d_only* element is not listed, none of the above restrictions is applied to the corresponding Managed Copy Unit.

✧ **three_d_full_frame_only:**

- The *three_d_full_frame_only* element may be optionally listed, and if the MCM finds this element, it shall not modify the original 3D video content in resolution, aspect ratio, image compression, frame rate, color channels or color depth when the 3D video Managed Copy of the corresponding Managed Copy Unit is made. For the purpose of clarity, the MCM is permitted to make a 3D video copy of the 3D video content by replicating each and every Left/Right image frame in its full form, including all parameters listed above. For further clarity, this element is not applicable to the making of 2D video Managed Copies.
- If the *three_d_full_frame_only* element is not listed, none of the above restrictions is applied to the corresponding Managed Copy Unit.

✧ **PlayListInfo:**

- The *PlayListInfo* is a data unit which includes a *title_number* and a *PlayListFileName* etc. Multiple *PlayListInfos* may be included in a *MCUPARTIAL*. If the order of playback sequence is defined, the *PlayListInfos* shall be listed in such order.
- **title_number:**
 - The *title_number* is used to identify the CPS Unit Key to process the Clip AV stream file(s) to be copied. The mapping table between the *title_number* and the CPS Unit Key is described in the CPS Unit Key File. Refer to Table 3-13 of this specification.
- **PlayListFileName:**
 - The *PlayListFileName* is a file path of the PlayList that refers to the Clip AV stream files to be copied. For example, this element will be the string such as “BDMV/PLAYLIST/00001.mpls”. In case of the PlayList that implements the Sequence Key, the selection of the PlayList depends on each player, therefore special string “BDMV/PLAYLIST/SK.mpls” shall be listed in this element.
 - If the *PlayListFileName* element does not include “dest” attribute (optional), the MCM may convert the file name of the original file during the copy process to match the path/filename specific to the target MCOT. If the *PlayListFileName* element includes a “dest” attribute (optional), the *dest* attribute indicates how this file is copied and is used on the destination media (i.e. this is useful for copying alternate database files that consists the new data structure). Note that the MCM may convert the path/filename indicated by the *dest* attribute during the copy process to match the path/filename specific to the target MCOT.
- **title:**

- The *title* holds a text string, such as a movie title or an episode title of a TV drama series, assigned to each PlayList. The MCM shall display this string.
- **selection:**
 - The *selection* element may be optionally listed and indicates the selection of substreams specified by the Content Provider or the Content Participant, in other words, *selection* enforces the MCM to choose the specified audio, subtitle or angle selection. The *audio* attribute specifies the Primary audio stream number, the *subtitle* attribute specifies the PG TextST stream number, the *angle* attribute specifies the Angle number. Note that "-1" indicates no selection is specified for *audio*, *subtitle* and *angle* attribute. The *angleInfo* attribute may be optionally listed, and provides text information of each angle.
- ◆ **Content ID:**
 - In case that the Content ID (*contentID* element) is not listed in the Managed Copy Manifest File or the Managed Copy Manifest File is not on the BD-ROM, *contentID* element in Offer Request Message shall be listed, and this element in Offer Request Message shall be set to zero. (i.e. 0x000...0). Note that in this case, the Content Certificate ID, that is always included in the Offer Response Message, is used for Managed Copy instead of the Content ID.

(Note 1) The *MCUALL* and the *MCUPARTIAL* elements directly under the *mcmfManifest* element are defined in this schema in order to keep compatibility for the legacy disc. Therefore, the MCM shall not use these elements. This means that these elements are not required to be listed in the Managed Copy Manifest File.

(Note 2) *PlayListFileName* shall indicate only the PlayList file that are actually recorded on the BD-ROM Media and the corresponding Clip AV stream files referred to by the PlayList shall be recorded on the BD-ROM. Even if the Virtual Package is available, only the files recorded on the BD-ROM Media are target of the Managed Copy. This means that VFS update of the Managed Copy Manifest File does not work.

5.4 Managed Copy Web Service

Managed Copy web service and the message used in this service that are specific to BD-ROM Media are defined in this section.

5.4.1 Web Service Description

Managed Copy web service description is used for communication between the MCM and the MCS. Managed Copy web service description for BD-ROM Media is defined in this section based on Managed Copy web service description defined in Appendix C of *AACS Pre-recorded Video Book* of this specification.

```
<?xml version="1.0" encoding="utf-8"?>
<wsdl:definitions
    targetNamespace="http://www.aacsla.com/2006/02/bdmcService"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:tns="http://www.aacsla.com/2006/02/bdmcService"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:bdmcp="http://www.aacsla.com/2006/02/bdmcPermission">
```

```

xmlns:aacsoffer="http://www.aacsla.com/2006/02/bdmcOffer"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
<wsdl:documentation>Managed Copy Web Service</wsdl:documentation>
<wsdl:types>
  <xs:schema elementFormDefault="qualified"
    targetNamespace="http://www.aacsla.com/2006/02/bdmcService">
    <xs:import
      namespace="http://www.aacsla.com/2006/02/bdmcPermission"
      schemaLocation="aacs_bdmanaged_permission.xsd" />
    <xs:import
      namespace="http://www.aacsla.com/2006/02/bdmcOffer"
      schemaLocation="aacs_bdmanaged_offer.xsd"/>
    <xs:element name="RequestOffers">
      <xs:complexType>
        <xs:sequence>
          <xs:element minOccurs="1" maxOccurs="1"
            name="cid" type="xs:string" />
          <xs:element minOccurs="1" maxOccurs="1"
            name="ccid" type="xs:base64Binary"/>
          <xs:element minOccurs="0" maxOccurs="8192"
            name="mcotList"
            type="tns:ArrayOfMCOTs" />
          <xs:element
            minOccurs="0" maxOccurs="1"
            name="serialNumber"
            type="xs:base64Binary" />
          <xs:element minOccurs="0" maxOccurs="1"
            name="sessionId" type="xs:string" />
          <xs:element minOccurs="1" maxOccurs="1"
            name="mcmNonce"
            type="xs:base64Binary" />
          <xs:element minOccurs="0" maxOccurs="128"
            name="LanguageCode" type="xs:string" />
          <xs:element minOccurs="0" maxOccurs="1"
            name="AACSOBJECTAttributes"
            type="xs:string" />
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:schema>
</wsdl:types>

```

```

        </xs:complexType>
    </xs:element>
    <xs:complexType name="ArrayOfMCOTs">
        <xs:sequence>
            <xs:element minOccurs="1" maxOccurs="1"
                name="mcotID" nillable="true"
                type="xs:string" />
            <xs:element minOccurs="0" maxOccurs="1"
                name="mcotMinorIDList">
                <xs:complexType>
                    <xs:sequence>
                        <xs:element minOccurs="1"
maxOccurs="8192" name="ID" type="xs:string" />
                    </xs:sequence>
                </xs:complexType>
            </xs:element>
        </xs:sequence>
    </xs:complexType>
    <xs:element name="RequestOffersResponse">
        <xs:complexType>
            <xs:sequence>
                <xs:element minOccurs="0" maxOccurs="1"
                    ref="aacsoffer:offers" />
            </xs:sequence>
        </xs:complexType>
    </xs:element>
    <xs:element name="RequestPermission">
        <xs:complexType>
            <xs:sequence>
                <xs:element minOccurs="1" maxOccurs="1"
                    name="MCUi" type="xs:string" />
                <xs:element minOccurs="1" maxOccurs="1"
                    name="sessionId" type="xs:string" />
                <xs:element minOccurs="0" maxOccurs="1"
                    name="MCM_MCOTInfo"
                    type="xs:base64Binary"/>
                <xs:element minOccurs="1" maxOccurs="1"
                    name="mcmNonce"
                    type="xs:base64Binary" />
            </xs:sequence>
        </xs:complexType>
    </xs:element>

```

```

        </xs:complexType>
    </xs:element>
    <xs:element name="RequestPermissionResponse">
        <xs:complexType>
            <xs:sequence>
                <xs:element minOccurs="0" maxOccurs="1"
                    ref="bdmcp:permission" />
            </xs:sequence>
        </xs:complexType>
    </xs:element>
</xs:schema>
</wsdl:types>
<wsdl:message name="RequestOffersSoapIn">
    <wsdl:part name="parameters" element="tns:RequestOffers" />
</wsdl:message>
<wsdl:message name="RequestOffersSoapOut">
    <wsdl:part name="parameters"
        element="tns:RequestOffersResponse" />
</wsdl:message>
<wsdl:message name="RequestPermissionSoapIn">
    <wsdl:part name="parameters" element="tns:RequestPermission" />
</wsdl:message>
<wsdl:message name="RequestPermissionSoapOut">
    <wsdl:part name="parameters"
        element="tns:RequestPermissionResponse" />
</wsdl:message>
<wsdl:portType name="ServiceSoap">
    <wsdl:operation name="RequestOffers">
        <wsdl:input message="tns:RequestOffersSoapIn" />
        <wsdl:output message="tns:RequestOffersSoapOut" />
    </wsdl:operation>
    <wsdl:operation name="RequestPermission">
        <wsdl:input message="tns:RequestPermissionSoapIn" />
        <wsdl:output message="tns:RequestPermissionSoapOut" />
    </wsdl:operation>
</wsdl:portType>
<wsdl:binding name="ServiceSoap" type="tns:ServiceSoap">

```

```

<soap:binding transport="http://schemas.xmlsoap.org/soap/http" />
<wsdl:operation name="RequestOffers">
  <soap:operation
    soapAction="http://www.aacsla.com/2006/02/managedCopyService/RequestOffers" style="document"/>
  <wsdl:input>
    <soap:body use="literal" />
  </wsdl:input>
  <wsdl:output>
    <soap:body use="literal" />
  </wsdl:output>
</wsdl:operation>
<wsdl:operation name="RequestPermission">
  <soap:operation
    soapAction="http://www.aacsla.com/2006/02/managedCopyService/RequestPermission"
    style="document" />
  <wsdl:input>
    <soap:body use="literal" />
  </wsdl:input>
  <wsdl:output>
    <soap:body use="literal" />
  </wsdl:output>
</wsdl:operation>
</wsdl:binding>
<wsdl:binding name="ServiceSoap12" type="tns:ServiceSoap">
  <soap12:binding
    transport="http://schemas.xmlsoap.org/soap/http" />
  <wsdl:operation name="RequestOffers">
    <soap12:operation
      soapAction="http://www.aacsla.com/2006/02/managedCopyService/RequestOffers" style="document" />
    <wsdl:input>
      <soap12:body use="literal" />
    </wsdl:input>
    <wsdl:output>
      <soap12:body use="literal" />
    </wsdl:output>
  </wsdl:operation>
</wsdl:binding>

```

```

</wsdl:operation>
<wsdl:operation name="RequestPermission">
  <soap12:operation
    soapAction="http://www.aacsla.com/2006/02/managedCopyService/RequestPermission"
    style="document" />
  <wsdl:input>
    <soap12:body use="literal" />
  </wsdl:input>
  <wsdl:output>
    <soap12:body use="literal" />
  </wsdl:output>
</wsdl:operation>
</wsdl:binding>
</wsdl:definitions>

```

(Note 1) cid is a string of hexadecimal with prefix "0X", in other words, cid will be 34 characters.

(Note 2) LanguageCode is a language code as defined in ISO639-2/T.

5.4.2 Offer Response Message

The Offer Response Message is a Web service message as defined in the Appendix A of *AACS Pre-recorded Video Book* of this specification, using the Managed Copy Offer Schema. This chapter defines a Managed Copy Offer Schema specific to BD-ROM Media.

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema targetNamespace="http://www.aacsla.com/2006/02/bdmcOffer"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:aacsoffer="http://www.aacsla.com/2006/02/bdmcOffer"
  xmlns:bdmcmf="http://www.aacsla.com/2006/02/bdmcManifest"
  elementFormDefault="qualified">
  <xs:import namespace="http://www.aacsla.com/2006/02/bdmcManifest"
    schemaLocation="mcmf.xsd"/>
  <xs:element name="offers">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="offersSignedContent">
          <xs:complexType>
            <xs:sequence>

```

```

<xs:element
    ref="aacsoffer:status"
    minOccurs="1"
    maxOccurs="1" />
<xs:element
    ref="aacsoffer:statusMessage"
    minOccurs="0"
    maxOccurs="1" />
<xs:element ref="aacsoffer:offer"
    minOccurs="0"
    maxOccurs="256" />
<xs:element
    ref="aacsoffer:render"
    minOccurs="0"
    maxOccurs="2"/>
<xs:element
    ref="aacsoffer:sessionId"
    minOccurs="1"
    maxOccurs="1" />
<xs:element
    ref="aacsoffer:mcmNonce"
    minOccurs="1"
    maxOccurs="1" />
<xs:element
    ref="aacsoffer:ccid"
    minOccurs="1"
    maxOccurs="1" />
<xs:element
    ref="aacsoffer:cid"
    minOccurs="1"
    maxOccurs="1" />
<xs:element
    ref="aacsoffer:serialNumber"
    minOccurs="0"
    maxOccurs="1"/>
<xs:element
    ref="aacsoffer:AACSObjectAttributes"
    minOccurs="0"
    maxOccurs="1"/>
<xs:element

```



```

                                ref="aacsoffer:dealManifest
                                "
                                minOccurs="0"
                                maxOccurs="1" />
                        </xs:sequence>
                </xs:complexType>
        </xs:element>
        <xs:element ref="aacsoffer:MCScert" minOccurs="1"
                maxOccurs="1" />
        <xs:element ref="aacsoffer:signature" minOccurs="1"
                maxOccurs="1" />
</xs:sequence>
<xs:attribute name="MKB" use="optional"
        type="xs:base64Binary" />
<xs:attribute name="version" use="required"
        type="xs:decimal" />
</xs:complexType>
</xs:element>
<xs:element name="offer">
        <xs:complexType>
                <xs:sequence>
                        <xs:element ref="aacsoffer:ISO639LanguageCode"
                                minOccurs="0" maxOccurs="1" />
                        <xs:element ref="aacsoffer:MCUi" minOccurs="1"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:title" minOccurs="1"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:abstract" minOccurs="1"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:description"
                                minOccurs="1" maxOccurs="1" />
                        <xs:element ref="aacsoffer:image" minOccurs="0"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:price" minOccurs="0"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:priceInfo" minOccurs="0"
                                maxOccurs="1" />
                        <xs:element ref="aacsoffer:serialNumberRequired"

```

```

        minOccurs="1" maxOccurs="1"/>
        <xs:element ref="aacsoffer:financialApplication"
            minOccurs="0" />
        <xs:element ref="aacsoffer:financialHTMLURL"
            minOccurs="0"
            maxOccurs="1" />
        <xs:element ref="aacsoffer:offerDetails" />
    </xs:sequence>
    <xs:attribute name="withheld" use="optional"
        type="xs:boolean" />
</xs:complexType>
</xs:element>
<xs:element name="dealManifest">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="bdmcmf:CopyUnit"
                minOccurs="0" maxOccurs="1"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="MCUi" type="xs:string" />
<xs:element name="image">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="aacsoffer:url" minOccurs="1"
                maxOccurs="1" />
            <xs:element ref="aacsoffer:title" minOccurs="1"
                maxOccurs="1" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="url" type="xs:anyURI" />
<xs:element name="title" final="restriction">
    <xs:simpleType>
        <xs:restriction base="xs:string">
            <xs:maxLength value="1024" />
        </xs:restriction>
    </xs:simpleType>
</xs:element>

```

```

    </xs:simpleType>
</xs:element>
<xs:element name="abstract" final="restriction">
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:maxLength value="1024" />
    </xs:restriction>
  </xs:simpleType>
</xs:element>
<xs:element name="description" final="restriction">
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:maxLength value="65536" />
    </xs:restriction>
  </xs:simpleType>
</xs:element>
<xs:element name="offerDetails">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="aacsoffer:videoParameters"
        minOccurs="0" maxOccurs="1" />
      <xs:element ref="aacsoffer:audioParameters"
        minOccurs="0" maxOccurs="1" />
      <xs:element name="sourceURI" type="xs:anyURI"
        minOccurs="0" maxOccurs="32" />
      <xs:element ref="aacsoffer:mcotInfo"
        minOccurs="1" />
      <xs:element ref="aacsoffer:hint" minOccurs="0" />
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="videoParameters">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="videoParametersName"
        type="xs:string" minOccurs="0"
        maxOccurs="1" />

```

```

        <xs:element
            ref="aacsoffer:minimumHorizontalResolution"
            minOccurs="0" maxOccurs="1" />
        <xs:element
            ref="aacsoffer:maximumHorizontalResolution"
            minOccurs="0" maxOccurs="1" />
        <xs:element ref="aacsoffer:minimumFrameRate"
            minOccurs="0" maxOccurs="1" />
        <xs:element ref="aacsoffer:videoBitrateInfo"
            minOccurs="0" />
    </xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="videoBitrateInfo">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="aacsoffer:videoCodecName"
                minOccurs="0" />
            <xs:element ref="aacsoffer:minimumBitRate"
                minOccurs="0" maxOccurs="1" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="audioParameters">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="audioParametersName"
                type="xs:string" minOccurs="0"
                maxOccurs="1" />
            <xs:element ref="aacsoffer:audioCodecName"
                minOccurs="0" />
            <xs:element ref="aacsoffer:minimumBitRate"
                minOccurs="0" maxOccurs="1" />
            <xs:element ref="aacsoffer:maximumBitRate"
                minOccurs="0" maxOccurs="1" />
            <xs:element ref="aacsoffer:minimumChannels"
                minOccurs="0" maxOccurs="1" />

```

```

        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="mcotInfo">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="aacsoffer:MCOT" />
            <xs:element ref="aacsoffer:mcotMinorCode"
                minOccurs="0" />
            <xs:element name="mcotOfferInfo"
                type="xs:base64Binary"
                minOccurs="0" maxOccurs="1" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="render">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="aacsoffer:renderURI" minOccurs="1"
                maxOccurs="1" />
            <xs:element ref="aacsoffer:renderType"
                minOccurs="1" maxOccurs="1" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="financialApplication">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="aacsoffer:financialApplicationURI"
                minOccurs="1" maxOccurs="1" />
            <xs:element
                ref="aacsoffer:financialApplicationType"
                minOccurs="1" maxOccurs="1" />
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="status" type="xs:nonNegativeInteger"/>
<xs:element name="statusMessage" type="xs:string"/>

```

```

<xs:element name="renderURI" type="xs:anyURI" />
<xs:element name="renderType" type="xs:string" />
<xs:element name="videoCodecName" type="xs:string" />
<xs:element name="audioCodecName" type="xs:string" />
<xs:element name="minimumBitRate" type="xs:nonNegativeInteger" />
<xs:element name="maximumBitRate" type="xs:nonNegativeInteger" />
<xs:element name="minimumHorizontalResolution"
    type="xs:nonNegativeInteger" />
<xs:element name="maximumHorizontalResolution"
    type="xs:nonNegativeInteger" />
<xs:element name="minimumFrameRate" type="xs:decimal" />
<xs:element name="minimumChannels" type="xs:decimal" />
<xs:element name="price" type="xs:string" />
<xs:element name="priceInfo" type="xs:string" />
<xs:element name="financialApplicationURI" type="xs:anyURI" />
<xs:element name="financialApplicationType" type="xs:string" />
<xs:element name="financialHTMLURL" type="xs:anyURI" />
<xs:element name="mcmNonce" type="xs:base64Binary" />
<xs:element name="MCScert" type="xs:base64Binary" />
<xs:element name="sessionId" type="xs:string" />
<xs:element name="signature" type="xs:base64Binary" />
<xs:element name="hint" type="xs:string" />
<xs:element name="MCOT" type="xs:string" />
<xs:element name="mcotMinorCode" type="xs:string" />
<xs:element name="ISO639LanguageCode" type="xs:string" />
<xs:element name="serialNumberRequired" type="xs:boolean" />
<xs:element name="ccid" type="xs:base64Binary" />
<xs:element name="cid" type="xs:string" />
<xs:element name="AACSOBJECTAttributes" type="xs:string" />
<xs:element name="serialNumber" type="xs:base64Binary" />
</xs:schema>

```

5.4.2.1 Definition/Usage of Offer Response Message

This section describes definition and usage of elements in Offer Response Message.

- ◆ The length of string type of XML schema is measured in units of byte in this chapter.
- ◆ **status:**

- The *status* indicates whether or not Offer Response has been provided to make the copy. This *status* field can also be used to facilitate the Application Layer's ability to determine the authorization status. A value of zero indicates success. Other value than zero may be used by each MCS with vendor-unique value. Note that in case of *status* has error value (other than zero), the *status* shall be displayed by MCM to user.

◆ **statusMessage:**

- It is required that the *statusMessage* is described in language specified in *LanguageCode* element in Request Offer Message if the language is supported by the MCS. The length of *statusMessage* shall be equal or less than 256 characters. Note that in case of *status* has error value (other than zero), the *statusMessage* shall be displayed by MCM to user, if it exists.

◆ **offer:**

- The *offer* can be listed up to 32 per MCOT.
- If the MCS receives the Offer Request Message for the disc which is not available for Managed Copy (for example, legacy disc which has no obligation for Managed Copy), the MCS shall omit *offer* element in the Offer Response Message.
- If the MCM receives the Offer Response Message without any *offer* element, the MCM shall notify the user that the Managed Copy service for the disc or for the MCM is not available.

- **ISO639LanguageCode:**

- ✧ The *ISO639LanguageCode* is a language code as defined in ISO639-2/T.

- **MCUi:**

- ✧ The *MCUi* is a string to identify *MCUALL* or *MCUPARTIAL*, and shall have the same string as *MCUi* under the corresponding *CopyUnit* element in the Managed Copy Manifest File or the Offer Response Message.

- **title / abstract:**

- ✧ It is required that the *title* and *abstract* are described in language specified in *ISO639LanguageCode* element in Request Offer Response Message. The length of these two elements shall be equal or less than 256 characters and be equal or less than 1024 bytes.

- **description:**

- ✧ It is required that the *description* is described in language specified in *ISO639LanguageCode* element in Request Offer Response Message. The length of this element shall be equal or less than 64K bytes. It is recommended that this element not typically exceed 1024 characters or 4K bytes.

- **price:**

- ✧ The *price* shall be omitted in the case the financial transaction is not necessary for the "offer", i.e. it is allowed to be made a Managed Copy free of charge.

- **priceInfo:**

- ✧ The *priceInfo* is optional string for the additional information to the user regarding price. For example, remaining copy count for free of charge or discount campaign information etc. would be candidate of this element and would be useful for the user. This element shall be displayed by MCM to the user, if the *priceInfo* element exists.

- **financialHTMLURL:**

- ✧ The *financialHTMLURL* shall be omitted in the case neither financial transaction nor accounting transaction are necessary for the *offer*.

- **offerDetails:**

✧ **sourceURI:**

- The *sourceURI* specifies a file or network location where prepared content which corresponds specifically with the *offer* as defined in the Section 5.5.4.2 of AACS *Pre-recorded Video Book* of this specification and is used to list file(s) with different format from BDMV format. The MCM shall ignore the *dealManifest* if the *sourceURI* element exists.

✧ **mcotInfo:**

- It is required that MCM compares the *mcotMinorCode* with *mcotMinorIDList* in Request Offer Message and does not display the corresponding offer if these two codes are different.

◆ **dealManifest:**

- Definition and Usage of *MCUALL* / *MCUPARTIAL* is described in Section 5.4.2.2 of this specification.
- The *dealManifest* indicates lists of *title_number* and *PlayList* file name which correspond to the files to be copied.

The length of HTTP message-body for Offer Response Message shall be less than or equal to 2 M bytes.

5.4.2.2 Definition and Usage of *MCUALL*/*MCUPARTIAL*

“*MCUALL*” and “*MCUPARTIAL*” are included in the Managed Copy Manifest File and/or the Offer Response Message.

“*MCUALL*” means that all the contents on the BD-ROM may be copied to the MCOT that supports bit-for-bit copy from the BD-ROM.

“*MCUPARTIAL*” means that a part of the content on the BD-ROM may be copied and includes the *title_numbers* and the *PlayList* file names. For example, if the “*PlayListFileName*” is “BDMV/PLAYLIST/00001.mpls”, the Clip AV stream files referred to by 00001.mpls are copied.

MCUi element is a string, which is an index to bind *MCUALL* / *MCUPARTIAL* and *offer* element and it is defined as follows:

- ◆ *MCUALL*/*MCUi* or *MCUPARTIAL*/*MCUi* in the Managed Copy Manifest File or the Offer Response Message
- ◆ *offersSignedContent*/*offer*/*MCUi* in the Offer Response Message

MCUi element under *MCUALL* or *MCUPARTIAL* element and its corresponding *MCUi* element under *offer* element have a one to one relationship, and the both *MCUi*’s shall have the same string value. The *MCUi* element can have any string value if the value is unique among all the *MCUi*’s in one Offer Response Message.

Figure 5-4 describes the structure of the Managed Copy Manifest File and the Offer Response Message. Relationship between them is explained below.

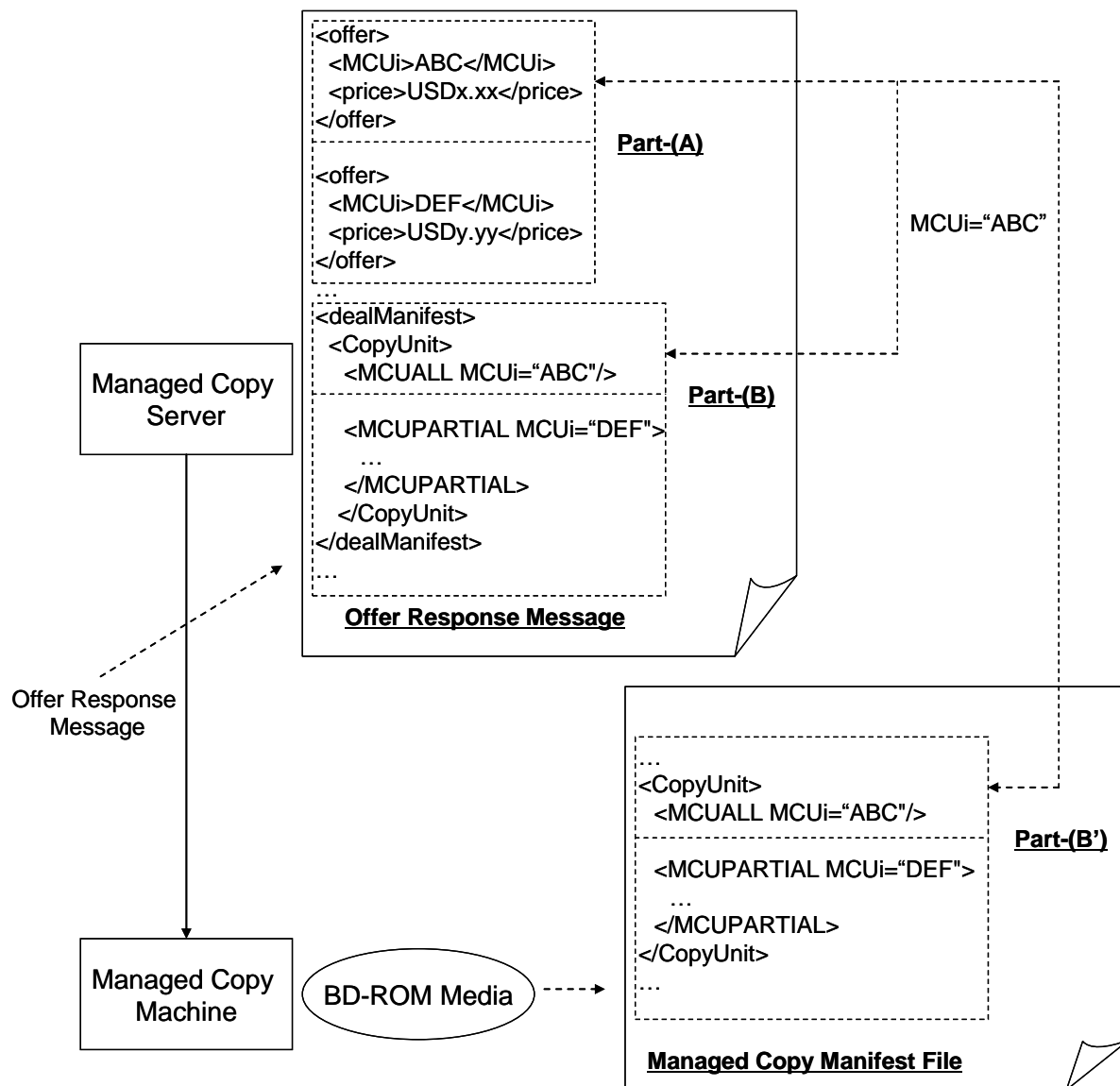


Figure 5-4 Structure of Managed Copy Manifest File and Offer Response Message

The Offer Response Message in Figure 5-4 is composed of two parts.

Part-(A) has *offer* elements, and each *offer* has *price*, *financialHTMLURL*, *mcotInfo* elements, etc. This part is always provided by the MCS, i.e. not stored on the BD-ROM disc.

Part-(B) has *CopyUnit* element, and *CopyUnit* element has *MCUALL*, *MCUPARTIAL* etc. This part is optional for the Offer Response Message, and the same kind of information may be stored in the Managed Copy Manifest File on the BD-ROM disc (illustrated as Part-(B')). Note that at least one of them, i.e. Part-(B) or Part-(B'), is required if the BD-ROM disc is made ready for the Managed Copy.

Each *offer* element in Part-(A) shall have one corresponding *MCUALL* or *MCUPARTIAL* in Part-(B) or Part-(B'). In other words, an *offer* and its corresponding *MCUALL* or *MCUPARTIAL* have one to one relationship. They are linked together by the value of *MCUi*. In the example above the first offer in Part-(A) has a value "ABC" in its *MCUi*, and the second offer has "DEF". Different *price*, *financialHTMLURL* or *mcotInfo* may be set for each *offer*.

For the *offer* “ABC”, the list of files to be copied is described in the first element in the *CopyUnit* in Part-(B) and/or Part-(B’) as *MCUALL*, and this *MCUALL* also has a value “ABC” in its *MCUi*.

For the *offer* “DEF”, the list of files is described in the second element in the *CopyUnit* in Part-(B) and/or Part-(B’) as *MCUPARTIAL*, and this *MCUPARTIAL* also has a value “DEF” in its *MCUi*.

When there are Part-(B) and Part-(B’) for a Part-(A), i.e. an offer, the Part-(B) has priority over the Part-(B’). All the combinations of Managed Copy Manifest File and Offer Response Message are explained in Table 5-1.

Table 5-1 defines the MCM’s behavior for each combination of *CopyUnit* in the Managed Copy Manifest File (MCMF) and *dealManifest* in Offer Response. The MCM shall refer to “MCUALL” or “MCUPARTIAL” to identify the list of files to be copied according to the rules described in Table 5-1.

Table 5-1 MCM’s behavior for MCMF/Offer Response

MCMF on the BD-ROM	dealManifest in Offer Response	MCM behavior
No MCMF	Mandatory, i.e. the title_number and the PlayList file name are required in Offer Response sent by the MCS	<ul style="list-style-type: none"> ◆ Sends the Content Certificate ID (to Default MCS) ◆ Refers to dealManifest for the title_number and the PlayList file name
MCMF without <i>CopyUnit</i> element, i.e. no title_number element	Mandatory, i.e. the title_number and the PlayList file name are required in Offer Response sent by the MCS	<ul style="list-style-type: none"> ◆ Refers to MCMF for the URI and the Content ID ◆ Sends the Content ID and the Content Certificate ID ◆ Refers to dealManifest for the title_id and the PlayList file name
MCMF with <i>CopyUnit</i> element, i.e. the title_number element included	Optional, i.e. the title_number and the PlayList file name may be in Offer Response sent by the MCS	In case that dealManifest is not in Offer Response sent by the MCS: <ul style="list-style-type: none"> ◆ Refers to MCMF for the URI and the Content ID ◆ Sends the Content ID and the Content Certificate ID ◆ Refers to MCMF for the title_id and the PlayList file name
		In case that dealManifest is in Offer Response sent by the MCS: <ul style="list-style-type: none"> ◆ Refers to MCMF for the URI and the Content ID ◆ Sends the Content ID and the Content Certificate ID ◆ Refer to dealManifest for the title_id and the PlayList file name

As described in the table above, both the title_id and the PlayList file name shall be included in at least one of the two places, i.e. in the Managed Copy Manifest File and/or in the Offer Response Message.

The value of the *MCUi* element shall be unique among all the offers within the Managed Copy Manifest File / Offer Response Message.

Some MCM implementations may not have ability to transcode the audio/video stream. Bit-for-bit copy of the audio/video stream or copy to Bound Copy Method can be specified by leaving out both *videoParameters* and *audioParameters* from the *offerDetails*.

5.4.3 Permission Response Message

Permission Response Message is a web service message as defined in the Appendix B of *AACS Pre-recorded Video Book* of this specification, using the Managed Copy Permission Schema. This chapter defines a Managed Copy Permission Schema specific to BD-ROM Media.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  targetNamespace="http://www.aacsla.com/2006/02/bdmcPermission"
  xmlns:bdmcp="http://www.aacsla.com/2006/02/bdmcPermission"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">
  <xs:element name="permission">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="permissionSignedContent">
          <xs:complexType>
            <xs:sequence>
              <xs:element ref="bdmcp:status"
                minOccurs="1" maxOccurs="1" />
              <xs:element ref="bdmcp:statusMessage"
                minOccurs="0" maxOccurs="1" />
              <xs:element ref="bdmcp:MCS_MCOTInfo"
                minOccurs="0" maxOccurs="1" />
              <xs:element ref="bdmcp:mcmNonce"
                minOccurs="1" maxOccurs="1" />
              <xs:element ref="bdmcp:MCUi"
                minOccurs="1" maxOccurs="1" />
              <xs:element ref="bdmcp:sessionId"
                minOccurs="1" maxOccurs="1" />
            </xs:sequence>
          </xs:complexType>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

```

        </xs:complexType>
    </xs:element>
    <xs:element ref="bdmcp:signature" minOccurs="1"
        maxOccurs="1" />
</xs:sequence>
</xs:complexType>
</xs:element>
<xs:element name="status" type="xs:nonNegativeInteger" />
<xs:element name="statusMessage" type="xs:string" />
<xs:element name="signature" type="xs:base64Binary" />
<xs:element name="MCS_MCOTInfo" type="xs:base64Binary" />
<xs:element name="mcmNonce" type="xs:base64Binary" />
<xs:element name="MCUi" type="xs:string" />
<xs:element name="sessionId" type="xs:string" />
</xs:schema>

```

5.5 Requirement for Managed Copy Machine

Basic requirements for the MCM are defined in Chapter 5 of *AACS Pre-recorded Video Book* of this specification. This section specifies additional details specific to BD-ROM Managed Copy.

5.5.1 Recovery process

Chapter 5 of *AACS Pre-recorded Video Book* of this specification defines that the Session ID, the MCUi and the MCS Certificate shall be cached on the MCM to provide the MCM with a recovery mechanism. In addition, some other data shall also be cached for BD-ROM Managed Copy. Regardless of the type of implementation, the MCM shall cache at least the following data:

- ◆ Session ID
 - The Player's resident program or a BD-J Application can keep the session with the MCS using this ID. The MCM shall keep integrity of this data.
- ◆ MCUi
 - Allows the Player's resident program or a BD-J Application to know the offer selected by the user. The MCM shall keep integrity of this data.
- ◆ MCS Certificate
 - The MCS Certificate is used for verification of Offer and Permission. The MCM shall keep integrity of this data.
- ◆ Content ID or Content Certificate ID
 - The Player's resident program or BD-J Application can check whether or not the previous Managed Copy operation which failed matches the currently inserted BD-ROM Media, by comparing the ID on the disc and the ID in the Recovery Cache. In case of dual layer disc, Content Certificate ID in Content000.cer shall be used. The MCM shall keep integrity of this data.
- ◆ dealManifest

- Allows the MCM to know what file(s) failed to be copied by Managed Copy. The MCM shall cache a MCUALL or a MCUPARTIAL in the dealManifest corresponding to the offer selected by the user. The MCM shall keep integrity of this data.
- ◆ Coupon
 - Allows the Player's resident program or a BD-J Application to display financial or account transaction status to the user.
- ◆ majorMcotID
 - Allows the MCM to recover the major ID of the Managed Copy Output Technology selected for the Managed Copy.
- ◆ minorMcotID
 - Allows the MCM to recover the minor ID of the Managed Copy Output Technology selected for the Managed Copy. Note that the minorMcotID may be empty string.
- ◆ mcotOfferInfo
 - Allows the MCM to recover the MCOT specific information. Note that the mcotOfferInfo may be an empty string.
- ◆ Status
 - Allows the Player's resident program or a BD-J Application to display further information on the transaction to the user.
- ◆ MCOTParams
 - Allows the Player's resident program or a BD-J Application to get additional information specific to the Managed Copy Output Technology.
- ◆ offer
 - Allows the MCM to know what and how the Managed Copy is to be performed. The MCM shall cache the offer selected by the user because the offer includes necessary information for the copy process, such as Video Codec Specific Information, Audio Codec Specific Information, and so on. The MCM shall keep integrity of this data.

The MCM shall cache one set of data listed above. The MCM shall overwrite the old data set with the new data set only if another set of data is cached. The timing of the cache overwrite shall be when the completeTransaction method is successfully completed. Prior to completion of the completeTransaction method, the MCM shall keep the old data set in the cache. The MCM shall keep the set of information in case of disc ejection or power off. Note that the MCM shall have at least 128K bytes of non-volatile storage for that purpose. In other words, the size of any set of data above shall be no more than 128K bytes.

In case that the recovery is necessary due to an interrupted transaction, the MCM should notify the user what content failed to be copied by Managed Copy and needs to be resumed, and may use cached information as listed above for this purpose.

When the MCM is in the recovery process, for Type A or B MCMs, the Player's resident program may retrieve from the Recovery Cache and display the information to provide notification.

For a Type C MCM, a BD-J Application may retrieve from the Recovery Cache using APIs and display this information to provide notification. If the Content ID or the Content Certificate ID of the currently inserted BD-ROM Media exists in the Recovery Cache, a BD-J Application need not call the verifyOffers method and the completeTransaction method. However, the verifyPermission method needs to be called before the makeCopy method.

Note:

- ◆ When the financial transaction is completed, any type of MCM shall store all the necessary data listed above in the Recovery Cache. Otherwise, the MCM shall not store any data in the Recovery Cache. Until the financial transaction is completed, the MCM shall keep the data listed above temporarily in a buffer.
- ◆ When the copy process is completed, the MCM shall clear all of the data in the Recovery Cache.
- ◆ If any data is stored in the Recovery Cache, this means that the financial transaction is completed, but the copy process is not completed. In this case, the MCM should notify the user.

5.5.2 Making a Managed Copy

The MCM shall not start the copy process of the Managed Copy unless it verifies that the Permission Response Message is correct as specified in Section 5.5.7.1 of AACS *Pre-recorded Video Book* of this specification. For each type of MCM, the following conditions are necessary to start the copy process:

- ◆ For a Type A or B MCM,
 - If an MCM verifies that permissionSignedContent in the Permission Response Message is correct, it can start a copy process. For details of the verification of permissionSignedContent, refer to Section 5.5.7.1 of AACS *Pre-recorded Video Book* of this specification,
- ◆ For a Type C MCM,
 - An MCM verifies permissionSignedContent using the verifyPermission method defined in Section 5.2.1.6.3.20 of this book. If the verifyPermission method returns true, in other words, all necessary information defined in Section 5.5.1 of this book are cached in MCM, it can start a copy process. Details of the verification of permissionSignedContent, refer to Section 5.5.7.1 of AACS *Pre-recorded Video Book*.

5.6 Requirement for Managed Copy ready BD-ROM disc

The section defines the requirement for the Managed Copy ready BD-ROM disc. Here is the requirement for each file / data regarding Managed Copy:

- ◆ Managed Copy Manifest File:
 - The MC-ready BD-ROM is recommended to have this file. If there is no Managed Copy Manifest File, the MCM can start the Managed Copy process by accessing the Default MCS and provides the Content Certificate ID to the Default MCS.
- ◆ URL of MCS:
 - This information is optional for the Managed Copy Manifest File. If there is no *URIList* element, the MCM can start the Managed Copy process by accessing the Default MCS.
- ◆ Content ID:
 - Managed Copy Manifest File is recommended to have this data. If there is no *contentID* element, the MCM provides only the Content Certificate ID to the MCS.

Note that the Content Certificate ID is always included in the Offer Request Message and Offer Response Message.

These files / data above are used for Managed Copy regardless of the MCM system model (Type A, B or C).

BD-J Application for Type B or C MCM is optional for MC ready disc.

- ◆ BD-J Application for Type B MCM (to launch the MCM):
 - This is optional for MC ready BD-ROM, but shall exist on BD-ROM if this BD-ROM is MC capable for the Type B MCM.
- ◆ BD-J Application for Type C MCM (for transactions with the MCS):
 - This is optional for MC ready BD-ROM, but shall exist on BD-ROM if this BD-ROM is MC capable for the Type C MCM.

Any other file / data on the BD-ROM for Managed Copy purpose are not required.

Regarding the offer preparation, refer to Section 5.3 and Section 5.4.2 of this specification.

5.7 Application/HTML for financial/accounting transaction

For making a Managed Copy from a BD-ROM, a BD-J Application or an HTML web page may be used for financial and/or accounting transaction purposes. Selection of an application or HTML depends on the type of MCM as follows:

- ◆ For a Type A MCM, an HTML web page is used for the financial/accounting transaction, because the Managed Copy Machine performs its process as illustrated in Figure 5-1,
- ◆ For a Type B MCM, an HTML web page is used for the financial/accounting transaction, because the Managed Copy Machine performs its process as illustrated in Figure 5-2,
- ◆ For a Type C MCM, a BD-J Application is used for the financial/accounting transaction, because the BD-J Virtual Machine performs its process as illustrated in Figure 5-3.

Details of the application/HTML for the financial/accounting transaction are defined in Section 5.3 of AACS *Pre-recorded Video Book* of this specification. Note that in addition to a BD-J Application or HTML web page, other Player-specific applications may be used for the financial/accounting transaction.

There are four types of MC ready discs. An MC ready disc is recommended to have a Managed Copy Manifest File including a Content ID, and shall have a Content Certificate including a Content Certificate ID.

- i. BD-ROM with Content ID/Content Certificate ID
- ii. BD-ROM with Content ID/Content Certificate ID and a BD-J Application for launching the MCM (used for a Type B MCM)
- iii. BD-ROM with Content ID/Content Certificate ID and a BD-J Application for transactions with the MCS (used for a Type C MCM)
- iv. BD-ROM with Content ID/Content Certificate ID, a BD-J Application for launching the MCM (used for a Type B MCM) and a BD-J Application for transactions with the MCS (used for a Type C MCM).

Note: a BD-J Application for launching the MCM and performing transactions with the MCS may be combined.

For each type of MC ready disc, the Content Provider shall prepare a BD-J Application and/or HTML web page for financial and/or accounting transaction purposes as specified in Table 5-2 and shall make it available on the MCS. Note that the HTML web page for financial and/or accounting transaction purposes is mandatory for all the MC ready discs, if financial or accounting transactions are necessary for the service.

Table 5-2 Application/HTML for financial/accounting transaction on a Managed Copy Server

	Type-i disc	Type-ii disc	Type-iii disc	Type-iv disc
BD-J Application for financial/accounting transaction	Not required	Not required	Required	Required
HTML web page	Required	Required	Required	Required

5.8 Recommendations for Offer preparation

This section specifies recommendations for content provider or service provider to make Managed Copy Manifest File and Offer Response etc.

5.8.1 Audio / Subtitle / Angle selection

BD-ROM disc supports multiple audio, subtitles and angles. On the other hand, it depends on each MCOT if the MCOT can support such feature. This section describes how to provide the selection method of Audio / Subtitle / Angle and defines the behavior of the MCM for such situation.

With *selection* element:

The Managed Copy Manifest File and the Offer Response Message have *selection* as an optional element. This element may be used to enforce the MCM to select the specified Audio / Subtitle / Angle selection. If this element exists, only the specified Audio / Subtitle / Angle of the copied content shall be played back. In other words, the MCM is required to copy only the specified Audio / Subtitle / Angle, or to ensure that the MCOT plays back only the specified Audio / Subtitle / Angle.

The following XML description is an example of the *CopyUnit* element in the Managed Copy Manifest File. The same example may be applicable to the *dealManifest* element in the Offer Response Message.

```
<mc:CopyUnit>
  <mc:MCUPARTIAL MCUi="0001">
    <mc:PlayListInfo>
      <mc:title_number>1</mc:title_number>
      <mc:PlayListFileName>BDMV/PLAYLIST/00030.mpls
      </mc:PlayListFileName>
      <mc:title>Movie1</mc:title>
      <mc:selection audio="1" subtitle="2"
        angle="3" angleInfo="Center-Angle" />
    </mc:PlayListInfo>
    <mc:PlayListInfo>
      <mc:title_number>1</mc:title_number>
      <mc:PlayListFileName>BDMV/PLAYLIST/00032.mpls
      </mc:PlayListFileName>
      <mc:title>Movie2</mc:title>
    </mc:PlayListInfo>
  </mc:MCUPARTIAL>
</mc:CopyUnit>
```



```

        </mc:PlaylistInfo>
    </mc:MCUPARTIAL>
</mc:CopyUnit>

```

In case of this example above, *selection* specifies that the Primary audio stream number is 1, PG TextST stream number is 2 and Angle number is 3. If it does not specify any parameter of the three, “-1” shall be set to the parameter.

Without *selection* element:

In case that BD-ROM has multiple audio, subtitles or angle, and there is no *selection* element neither in the Managed Copy Manifest File or in the Offer Response Message, the MCM shall behave as follows:

- ◆ If the MCOT does not support multiple audio / subtitles, the MCM shall have the user interface for the user to select audio / subtitle.
- ◆ If the MCOT supports multiple audio / subtitles, the MCM may copy all of the audio / subtitle and audio / subtitle selection would be available in MCOT.

Note that angle selection depends on each implementation in case of no *selection* element.

5.8.2 Recommendations for the MCUPARTIAL

The MCUPARTIAL is configured to list the *PlaylistInfo* elements so that the MCM that supports neither the navigation command or the BD-J applications can identify the files to be copied. In other words, neither the navigation command or the BD-J application is copied to the MCOT, and can be used to identify the playback sequence. Therefore, the title that has a complicated playback path controlled by the navigation command or the BD-J application is not a good candidate to be listed in the MCUPARTIAL. For example, Divergence Title, Recurrence Title and Side presentation path defined in Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specifications are such titles with a complicated playback path.

It is strongly recommended that the MCUPARTIAL only includes the PlayLists with a sequential playback path.

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Chapter 6

Details for Sequence Keys and Unified MKB

6. Introduction

Sequence Keys and Sequence Key Block are specified in Chapter 4 of the *Pre-recorded Video Book* of this specification. This chapter describes additional details of Sequence Keys for BD-ROM disc and Application Format.

Unified Media Key Block (MKB) is specified in Chapter 3 of the *Introduction and Common Cryptographic Elements* book of this specification. This chapter also describes additional details of Unified MKB for BD-ROM disc and Application Format.

BD-ROM applies the multiple PlayList approach and 256 PlayLists are used per a Sequence Key Block / Unified MKB for this purpose.

The Segment Keys are used for encrypting the Segment Portion in Clip AV stream file and are stored in the Segment Key File.

6.1 PlayList approach for Sequence Keys / Unified MKB

A BD-ROM disc has at most six Sequence Key Blocks and six Unified MKBs. For both Sequence Key Blocks and Unified MKBs, 1024 Variant Data are assigned. The Variant Number is calculated from each Sequence Key Block / Unified MKB. The Variant Number is used to determine the PlayList_id of the PlayList to be played back. Each PlayList contains a set of PlayItems for Segment Portion and non-Segment Portion and each PlayItem for Segment Portion points out to one of the variations for that Segment Portion.

Figure 6-1 describes an overview of PlayList approach for Sequence Keys / Unified MKB.

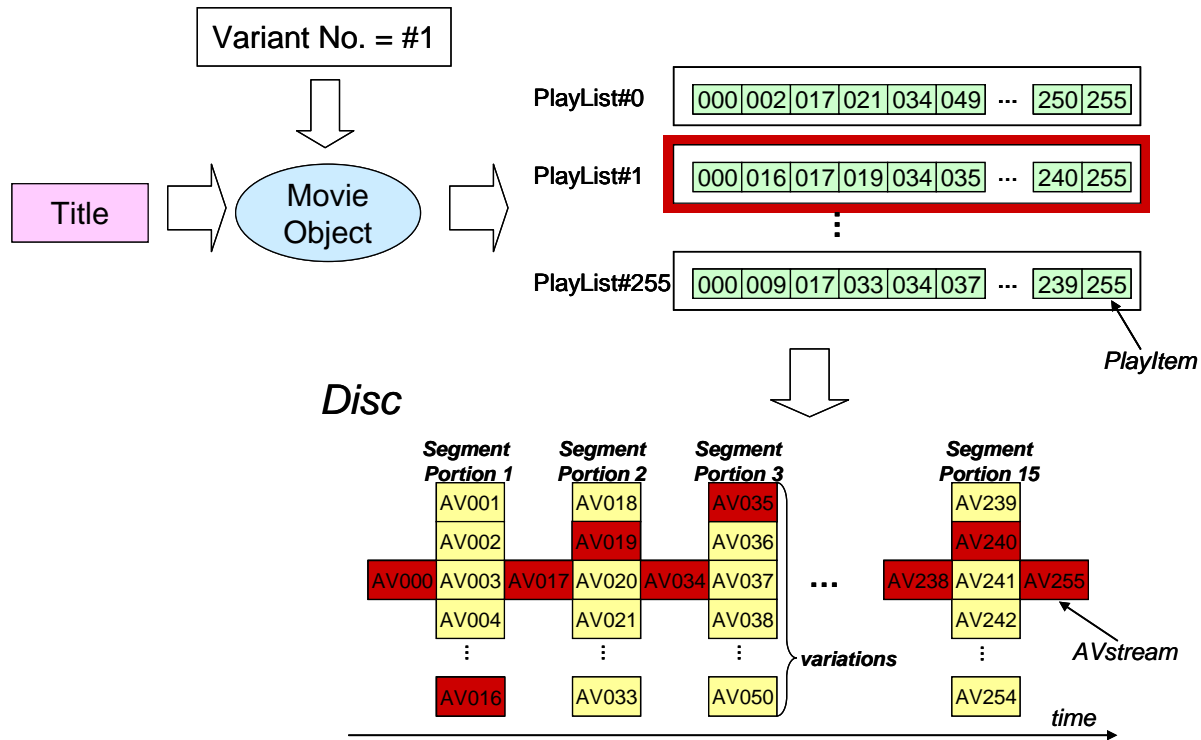


Figure 6-1 Overview of PlayList approach for Sequence Key Block / Unified MKB

Each Clip AV stream referred from PlayItem (AV000, AV001, AV002, ..., AV255) is recorded as an individual Clip AV stream file and each Segment Portion (AV001, AV002, AV003, ..., AV254) is encrypted by a different Segment Key.

(Note 1) At least one Clip AV stream of non-Segment Portion shall be allocated between Segment Portion i and Segment Portion $(i + 1)$.

(Note 2) Sequence Key Block / Unified MKB are applicable for only main TS and are not applicable for sub TS.

6.2 Playback process for BD-ROM Player

6.2.1 Encryption and Decryption Overview

This section describes the encryption and decryption process for (a) Segment Portion and (b) non-Segment Portion on the BD-ROM Disc on which the Sequence Key Block and Unified MKB are assigned.

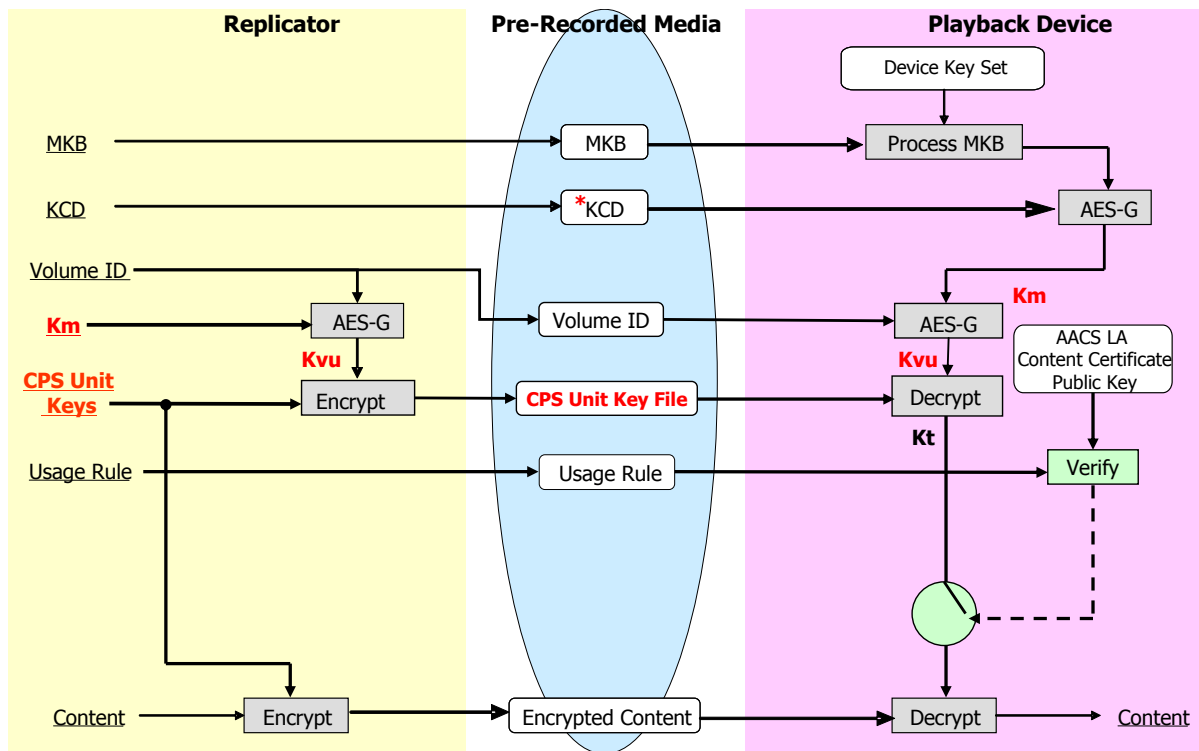
The Sequence Key Block Files “SKB1.inf”, “SKB2.inf”, “SKB3.inf”, “SKB4.inf”, “SKB5.inf” and “SKB6.inf” shall be recorded in the “\AACS” directory and in the “\AACS\DUPLICATE” directory. In case of the BD-ROM disc on which the SKB is assigned, the number of the SKB shall be between one and six and the index of SKB file name shall be defined in continuous order, starting from one. For example, in case of three SKBs are assigned on the BD-ROM disc, the SKB1.inf, SKB2.inf and SKB3.inf shall be recorded on the disc.

SKB data shall be recorded from the first byte of the file, and the null (00_{16}) padding may be attached after the SKB data in the file for the authoring and the mastering purpose.

In the same way, the Unified MKB “uMKB1.inf”, “uMKB2.inf”, “uMKB3.inf”, “uMKB4.inf”, “uMKB5.inf” and “uMKB6.inf” shall be recorded in the “\AACS” directory and in the “\AACS\DUPLICATE” directory. In case of BD-ROM disc on which the SKB is assigned, uMKB shall also be assigned for the disc, and vice versa. Also, the number of Unified MKB shall be same as that of Sequence Key Block. For example, in case of four SKBs are assigned on the BD-ROM disc, four Unified MKBs shall be recorded on the disc, i.e. uMKB1.inf, uMKB2.inf, uMKB3.inf and uMKB4.inf shall be recorded.

On the other hand, for the BD-ROM disc on which the Sequence Key Block / Unified MKB is not assigned, Process SKB / Unified MKB is omitted and the Volume Unique Key is used instead of the Volume Variant Unique Key. In this case, the Sequence Key Block, Unified MKB and the Segment Key file are not recorded on the disc.

Figure 6-2 describes an encryption and decryption overview for the BD-ROM disc on which the Sequence Key Block / Unified MKB is not assigned.



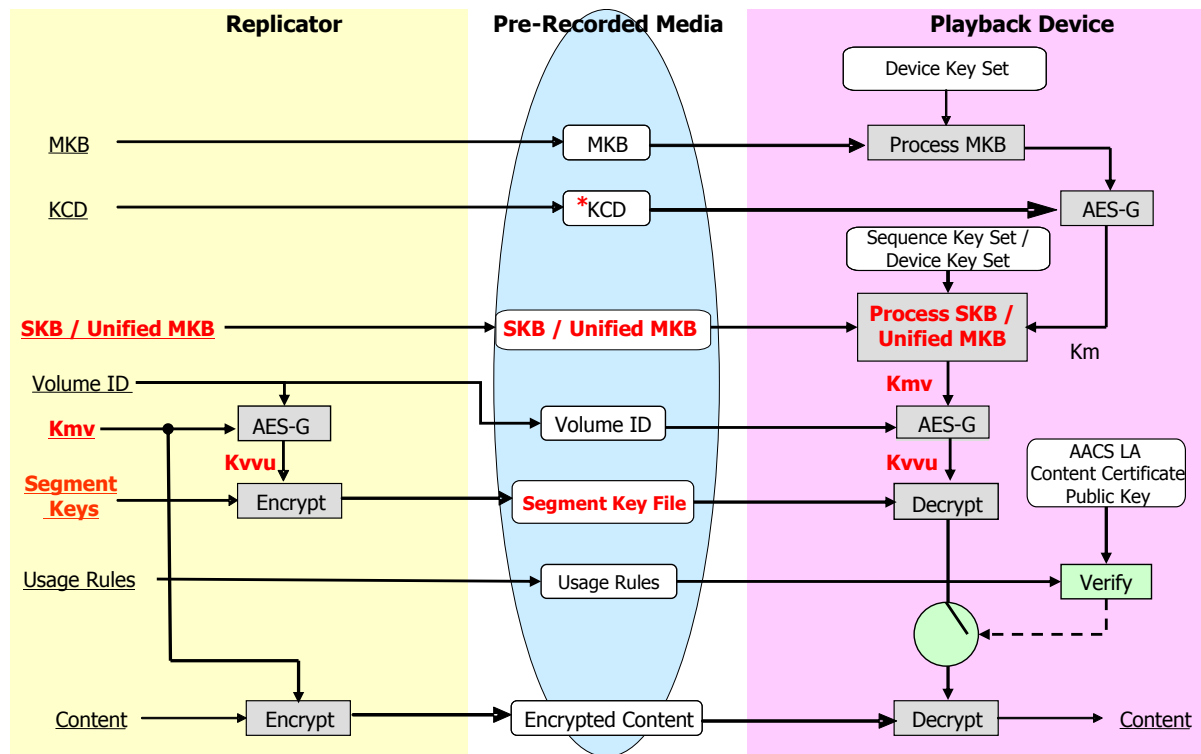
***KCD is used by only certain classes of devices.**

Figure 6-2 Encryption and Decryption Overview for BD-ROM on which SKB / uMKB is not assigned

6.2.1.1 Key Hierarchy for Segment Portion

For the Segment Portion, the Segment Key is used for encrypting instead of the CPS Unit Key. 240 (16 variations * 15 segments) Segment Keys are used for one SKB / Unified MKB and these keys are recorded in the Segment Key File.

Figure 6-3 describes an encryption and decryption overview for the Segment Portion on the BD-ROM disc on which the SKB and Unified MKB are assigned.



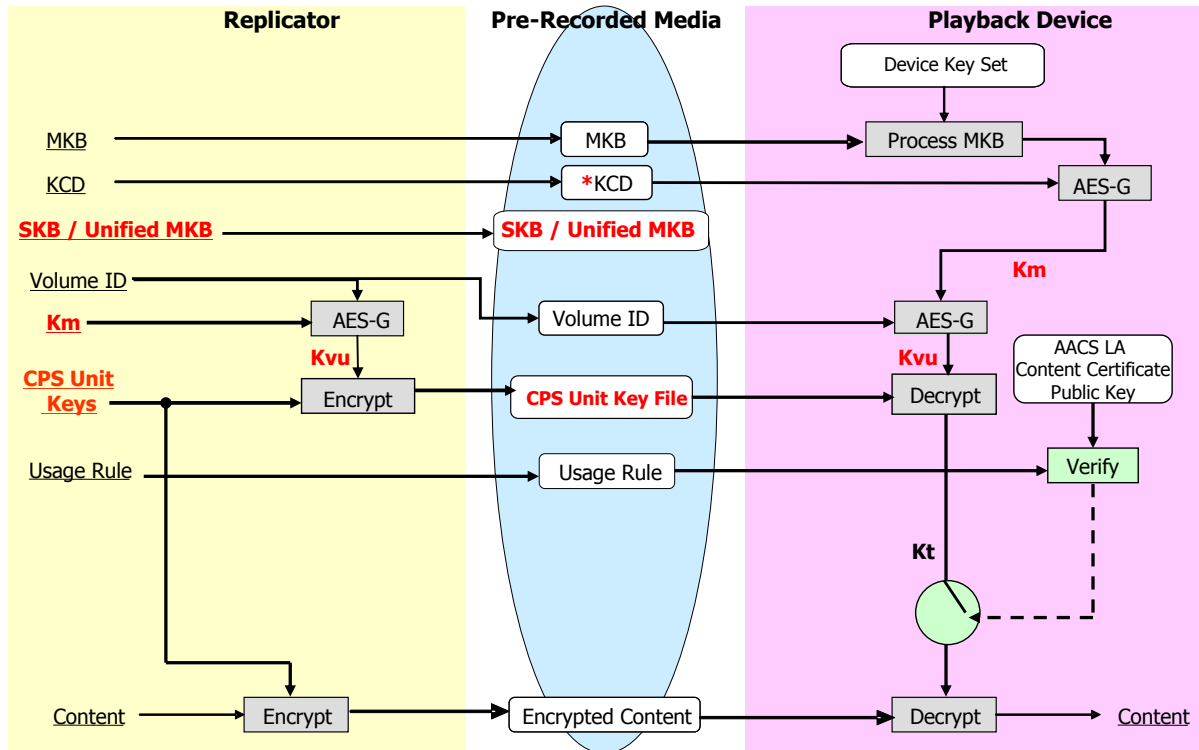
***KCD is used by only certain classes of devices.**

Figure 6-3 Encryption and Decryption Overview for Segment portion

6.2.1.2 Key Hierarchy for non-Segment Portion

For the non-Segment Portion which means that it is not the Segment Portion, the CPS Unit Keys are used for encrypting instead of the Segment Key.

Figure 6-4 describes an encryption and decryption overview for the non-Segment Portion on the BD-ROM disc on which the SKB and Unified MKB are assigned.



***KCD is used by only certain classes of devices.**

Figure 6-4 Encryption and Decryption Overview for non-Segment Portion

6.2.2 Selection process of a PlayList

The BD player selects a proper PlayList to be player back by using a Movie Object for Title defined in Section 3.9.1.8 of this specification.

(Note) The assignment of the Player Status Registers for the Playlist_Indicator is PSR96 and PSR97.

This is the example of the Movie Object programmed a PlayList selection for one SKB and one Unified MKB. This example assumes that PlayList_id #0 to #255 are assigned for SKB1 and uMKB1.

```
MovieObject(){
    Number_of_navigation_commands (=4);
```

```

    Move[GPR#Y][PSR96];
    And[GPR#Y][0xFF000000];
    Shift Right[GPR#Y][0x18];
    PlayPL[GPR#Y];
}

```

For example, the Movie Object for PlayList selection includes “Number_of_navigation_commands” and “PlayPL”.

“Number_of_navigation_commands” indicates the number of navigation_command structures that are contained with the Movie Object().

“PlayPL (PlayList_id = PSR)” commands the playback of PlayList#(PlayList_id). Note that each PlayPL for each SKB / Unified MKB shall not command the playback of the same PlayList#(PlayList_id). In other words, for six SKBs and six uMKBs, at least 1536 PlayLists are necessary.

This is the example of the Movie Object programmed a PlayList selection for two SKBs and two Unified MKBs. This example assumes that PlayList_id #0 to #255 and PlayList_id #256 to #511 are assigned for SKB1 / uMKB1 and SKB2 / uMKB2 respectively.

```

MovieObject(){
    Number_of_navigation_commands (=9);
    Move[GPR#Y][PSR96];
    And[GPR#Y][0xFF000000];
    Shift Right[GPR#Y][0x18];
    PlayPL[GPR#Y];

    Move[GPR#Y][PSR96];
    And[GPR#Y][0x00FF0000];
    Shift Right[GPR#Y][0x10];
    Add[GPR#Y][0x100];
    PlayPL[GPR#Y];
}

```

“PSR” is the Player Status Register, which can be stored a fixed length variable. The PlayList Indicator for each SKB / uMKB derived from the PlayList_id is set to the PSR.

Figure 6-5 describes an example of the data format of PSR for this purpose. Playlist_Indicator #1, Playlist_Indicator #2, Playlist_Indicator #3, ... and Playlist_Indicator #6 corresponds to “SKB1.inf” / “uMKB1.inf”, “SKB2.inf” / “uMKB2.inf”, “SKB3.inf” / “uMKB3.inf”, ..., and “SKB6.inf” / “uMKB6.inf” respectively. These Playlist_Indicators are computed as follows:

$$\text{Playlist_Indicator \#i} = \text{PlayList_id \#i} \bmod 256 \quad (i = 1, 2, 3, \dots, 6)$$

where PlayList_id #i denotes the PlayList_id corresponding the SKBi / uMKBi.

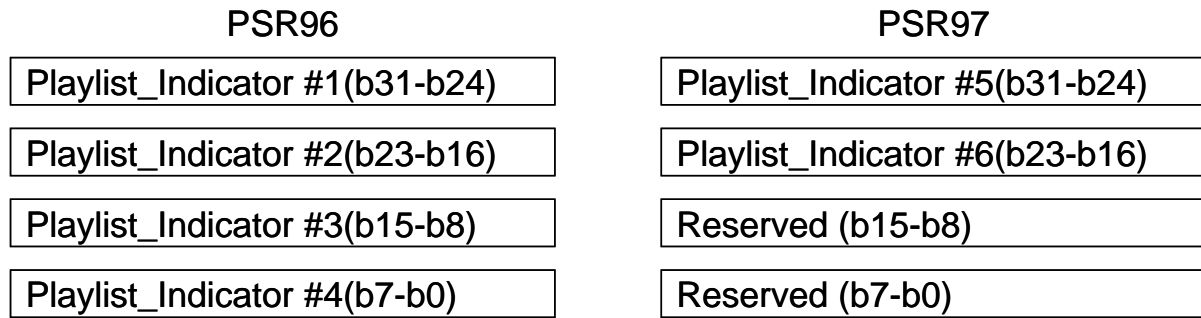


Figure 6-5 Data format of PSR

6.3 Segment Key File

Each Segment Portion is encrypted by the Segment Key and each Segment Key is encrypted by the Volume Variant Unique Key. The Volume Variant Unique Key is defined for each PlayList, in other words, 1024 Volume Variant Unique Keys are used for encrypting the Segment Keys per one Sequence Key Block / Unified MKB. The Segment Key File “Segment_Key.inf” shall be recorded in the “\AACS” directory and in the “\AACS\DUPLICATE” directory.

Table 6-1 shows the data format of the Segment Key File.

Table 6-1 Data Format of Segment Key File

Syntax	No. of bits	Mnemonic
Segment_Key_File(){		
Num_of_SKB_Unified_MKB	16	
For(I=0; I < Num_of_SKB_Unified_MKB; I++){		
For(J=0; J < 1024; J++){		
PlayList_id (= X)	16	
For(K=0; K < 15; K++){		
PlayItem_id(X, K)	16	uimsbf
Encrypted Segment Key for PlayList/PlayItem(X, K)	128	uimsbf
}		
}		
}		
}		

Num_of_SKB_Unified_MKB indicates the number of Sequence Key Blocks / Unified MKBs on the BD-ROM disc. For example, in case three SKBs and three Unified MKBs are recorded, Num_of_SKB_Unified_MKB shall be 0003₁₆.

PlayList_id indicates the PlayList for a particular Variant Number for a particular SKB / uMKB.

PlayItem_id indicate the PlayItem assigned corresponding encrypted Segment Key.

Encrypted Segment Key for PlayList/PlayItem(X, K) contains the 16 bytes of the encrypted Segment Key for used for encrypting the PlayItem(X, K). The Segment Key is encrypted as follows:

$$\text{AES_128E}(K_{\text{vnu-J}}(I, J), \text{Segment Key}(X, K))$$

where $K_{\text{vnu-J}}$ denotes a Volume Variant Unique Key defined in Section 3.3 of the *Pre-recorded Video Book* of this specification and corresponds to the Variant Number “J”.

(Note) Different Segment Keys shall be assigned to different Segment Portions.

Calculation method for the Block key for Segment Portion is described in Figure 6-6.

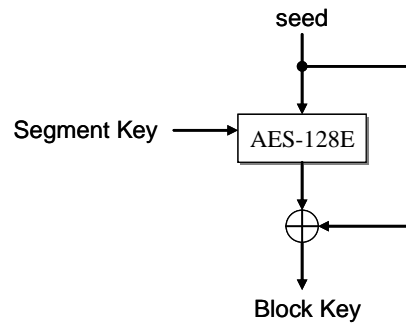


Figure 6-6 Calculation method for the Block Key from the Segment Key

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Chapter 7

Clarifications for Unencrypted Content

7. Introduction

For the BD Prerecorded Disc (BD-ROM) and Binding Unit Data Area of Local Storage, both encrypted content and unencrypted content can be recorded as AACS Signed Content. This chapter describes details of disc structure for the BD-ROM containing unencrypted content.

7.1 Disc structure

CPS Unit structure defined in Section 3.9 shall be also applied for unencrypted content, i.e. Usage Rule shall be also defined for unencrypted content. Encrypted portion and unencrypted portion cannot be mixed in one CPS Unit except the cases defined in Section 7.4, because a Usage Rule is constant in one CPS Unit.

7.1.1 CPS information files for unencrypted content

This section describes clarifications for the necessary CPS information files for BD-ROM composed of the followings:

- only unencrypted content
- both encrypted content and unencrypted content.

7.1.1.1 BD-ROM composed of only unencrypted content

BD-ROM that contains unencrypted content and does not contain any encrypted content shall store all the CPS information files defined in Figure 3-5. In other words, such BD-ROM shall store the followings:

- CPS Unit Key File
- MKB and Read/Write MKB
- Sequence Key Block (Optional)
- Unified MKB (Optional)
- Segment Key File (Optional)
- Managed Copy Manifest File (Optional)
- Content Revocation List
- Content Certificate
- Content Hash Table
- CPS Unit Usage File.

In addition to above CPS information files, Volume ID and Partial MKB shall be stored on BD-ROM.

For such BD-ROM, CPS Unit Key shall be assigned for all CPS Units (and the key is not used for decryption).

Note that for the BD-ROM that does not contain any (encrypted) AACCS Content, the Type 3 MKB defined in Section 3.2.5.1 of *Introduction and Common Cryptographic Elements* book of this specification shall be used as the MKB “MKB_RO.inf”.

The Content Certificate and the Content Hash Table are applied for all unencrypted Clip AV streams on such BD-ROM. A Licensed Player shall verify the Content Certificate and the Content Hash Table for unencrypted Clip AV stream.

7.1.1.2 BD-ROM composed of both encrypted content and unencrypted content

BD-ROM that contains both encrypted content and unencrypted content shall also store all the CPS information files clarified in Section 7.1.1.1. For such BD-ROM, the CPS Unit number for unencrypted content shall be different from the number for encrypted content.

For such BD-ROM, CPS Unit Key shall be assigned for all CPS Units (and some keys are used for decryption and others are not).

For the BD-ROM that contains both encrypted content and unencrypted content, the Type 3 or Type 4 MKB shall be used as the MKB “MKB_RO.inf”.

The Content Certificate and the Content Hash Table cover both encrypted and unencrypted content. A Licensed Player shall verify the Clip AV stream regardless of encrypted or unencrypted.

7.2 Usage Rules for Unencrypted content

Basic CCI for AACCS defined in Section 3.9.4.2 shall contain the following Usage Rules for a CPS Unit composed of such content:

- EPN: EPN-unasserted ($=1_2$)
- CCI: Copy Control Not Asserted ($=00_2$)
- Image_Constraint-Token: High Definition Analog Output in High Definition Analog Form ($=1_2$)
- Digital_Only-Token: Output of decrypted content is allowed for Analog/Digital Outputs ($=0_2$)
- APSTB: APS off ($=000_2$)
- Type_of_Title: Basic Title ($=0_2$)

Note that an Enhanced Title Usage for AACCS defined in Section 3.9.4.3 of this specification shall not be used for such a CPS Unit.

7.3 Copy Permission Indicator for Unencrypted content

Copy_permission_indicator defined in Section 3.10.2 of this specification indicates whether a corresponding Aligned Unit is encrypted or not and shall be set as shown in Table 7-1.

Table 7-1 Copy_permission_indicator

Copy_permission_indicator	Meaning
00 ₂	unencrypted
01 ₂	Reserved
10 ₂	Reserved
11 ₂	encrypted

For unencrypted content, i.e. Copy_permission_indicator = 00₂, Licensed Player shall treat such content according to the Usage Rules defined in Section 7.2 of this specification. If the Licensed Player encounters the packet with Copy_permission_indicator set to 10₂ or 01₂, the data shall be considered encrypted.

7.4 Exceptional Rule for CPS Unit

As described in Section 7.1, all Clip AV stream files in one CPS Unit shall be encrypted by the same Unit Key. Note that it is also allowed as a special case that all Clip AV stream files in one CPS Unit are unencrypted as clarified in Section 7.1.1.2.

As an exception, both encrypted and unencrypted Clip AV stream files may co-exist within one CPS Unit for the following two cases.

In these cases, a player's behavior of handling the corresponding Usage Rule for unencrypted Clip AV stream files is dependent on the implementation.

7.4.1 Case 1

Under the following conditions, both encrypted and unencrypted Clip AV stream files may co-exist within one CPS Unit.

- All Clip AV stream files in this CPS Unit shall be encrypted, if it is recorded on BD-ROM.
- Clip AV stream files in this CPS Unit may be encrypted or unencrypted, if it is stored at the Binding Unit Data Area of Local Storage
- Within one Clip AV stream file, the encrypted portion and unencrypted portion shall not co-exist.
- Any PlayList shall not refer to both encrypted and unencrypted Clip AV stream files

7.4.2 Case 2

Under the following conditions, both encrypted and unencrypted Clip AV stream files may co-exist within one CPS Unit.

- All Clip AV stream files in this CPS Unit shall be encrypted, if it is recorded on BD-ROM.
- Clip AV stream files in this CPS Unit may be encrypted or unencrypted, if it is stored at Binding Unit Data Area of Local Storage
- Clip AV stream file used as main TS in this CPS Unit shall be encrypted
- Clip AV stream file used as sub TS in this CPS Unit may be encrypted or unencrypted
- Number of SubPath shall be one

- SubPathType shall be "Out-of-mux and Synchronous type of Picture-in-Picture presentation path"
- PlayItem and SubPlayItem shall be aligned
- There shall not be any time-gap in SubPath

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Chapter 8

Additional Requirements for The 3D Feature

8. Introduction

The 3D feature has been introduced by the Blu-ray Disc Association in its specification book of System Description Blu-ray Disc Read-Only Format part 3: Audio Visual Basic Specifications, Version 2.4. This chapter describes additional requirements for Licensed Players and BD-ROM discs with the 3D feature.

8.1 3D Application Format and Encryption

This section describes additional information and requirements with regard to the application format and encryption which is described in Chapter 3 of this specification.

8.1.1 Stereoscopic Interleaved File

In addition to the Clip AV stream file described in Section 3.9.1.1 of this specification, the Stereoscopic Interleaved file is defined for the 3D feature. The Stereoscopic Interleaved File is composed of two Clip AV stream files, one is for left view and the other is for right view. The two Clip AV stream files are interleaved inside the Stereoscopic Interleaved file. Note that the same sectors on the 3D disc are shared by the Stereoscopic Interleaved file and the two Clip AV stream files. The File System layer enables a set of files to share the same sector data.

8.1.2 Encryption Scheme

When AACS encryption is applied to the 3D content, the Stereoscopic Interleaved file and the two Clip AV stream files share the same data encrypted as defined in Section 3.10.1 of this specification. Therefore, if the Clip AV stream files under "\BDMV\STREAM" directory are encrypted, the corresponding Stereoscopic Interleaved files under "\BDMV\STREAM\SSIF" are also encrypted. Within the Stereoscopic Interleaved file, segments of the two Clip AV stream files are recorded alternately. The boundary of these segments shall be always aligned to Aligned Unit boundary, so that there is no impact on the encryption scheme of the Stereoscopic Interleaved file.

8.1.3 Bus Encryption

When the Clip AV stream files are bus-encrypted as defined in Section 3.7 of this specification, the corresponding Stereoscopic Interleaved files are also bus-encrypted.

8.2 Content Revocation

This section describes additional information and requirements with regard to the content revocation which is described in Chapter 2 of this specification.

8.2.1 Content Certificate

The BD-ROM with the 3D feature shall use the same data format for the Content Certificate as defined in Table 2-1.

8.2.2 Content Hash Table

The Content Hash Table on the 3D disc shall contain Hash Values for hash unit of all Clip AV stream files in the same manner as defined in Section 2.3.1 of this specification. Hash Values for hash units of the Stereoscopic Interleaved files shall not be recorded. Note that the Content Hash Table indirectly contains Hash Values for hash units of the Stereoscopic Interleaved files because the Stereoscopic Interleaved file shares the same sector data with the corresponding Clip AV stream files as described in Section 8.1.1 of this specification.

8.2.3 Hash Calculation

The Hash Value for each hash unit of the Clip AV stream shall be calculated in the same manner described in Section 2.3.2.1 of this specification.

8.2.4 Verifying Content Certificate

When the Licensed Player does not support 3D playback (herein after called as 2D Licensed Player), the hash check process for 2D and 3D discs is the same as that for 2D discs, as defined in Section 2.3.3.1 of this specification. Note that 2D Licensed Players do not read Stereoscopic Interleaved files.

When the Licensed Player supports 3D playback (herein after called as 3D Licensed Player), and when the 3D Licensed Player reads 2D Clip AV stream files for 2D playback from 2D and 3D discs, the hash check process is same as that for a 2D Licensed Player. In some cases, a 3D Licensed Player reads 2D Clip AV stream files from a 3D disc for 2D playback. For example, if the display is only for 2D playback, even 3D Licensed Players can playback 2D Clip AV stream files from a 3D disc.

When the 3D Licensed Player reads 3D Clip AV stream files from a 3D disc for 3D playback, the hash check process is the same as that for 2D Licensed Players.

When the 3D Licensed Player reads a Stereoscopic Interleaved file for 3D playback, and when the 3D Licensed Player applies procedure a) defined in Section 2.6 of Pre-recorded Video Book of this specification for the hash check process, the hash check process is the same as that for 2D Licensed Players.

When the 3D Licensed Player reads a Stereoscopic Interleaved file for 3D playback, and when the 3D Licensed Player applies procedure b) for hash check process, the 3D Licensed Player shall extract the corresponding Hash Value from the Content Hash Table using a mapping table between the two Clip AV stream files and the Stereoscopic Interleaved file. For the detail of this mapping table, refer to Blu-ray Disc Association, System Description Blu-ray Disc Read-Only Format, part 3: Audio Visual Basic Format Specification.

Table 8-1 Hash Check Process for 2D and 3D disc

	2D Licensed Player	3D Licensed Player		
	2D playback from 2D and 3D disc	2D playback from 2D and 3D disc	3D playback from 3D disc	
			Read Clip AV stream files for 3D playback	Read Stereoscopic Interleaved file for 3D playback
procedure a)	Same *	Same *	Same *	Same *
procedure b)	Same *	Same *	Same *	Extract expected Hash Value from Content Hash Table referring mapping table of two Clip AV stream files and Stereoscopic Interleaved file

* Hash Check Process is same as the case that 2D Licensed Player reads Clip AV stream files from 2D disc.

8.3 Sequence Keys / Unified MKB

This section describes additional information and requirements with regard to the Sequence Keys and Unified MKB which is described in Chapter 6 of this specification.

8.3.1 Application rule of Sequence Keys / Unified MKB for 3D disc

Sequence Key Block / Unified MKB are applicable for 3D disc, only when the Stereoscopic Interleaved file is not used. In the other words, they are not applicable for 3D disc with Stereoscopic Interleaved file.

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Annex A. Restriction on Data Allocation (Informative)

This annex includes the information for Authoring Facility.

AACS introduces the following restrictions on data allocation for ease of mastering and content hash verification. When the Authoring Facility makes the disc image, the Authoring Facility shall comply with these restrictions.

- All the extents of each Clip AV stream file shall be allocated with ascending order in physical layer.
- Each physical sector in an Aligned Unit shall be allocated contiguously on the BD-ROM disc.
- If a Clip AV stream file is recorded over both physical layers in dual-layer disc, the total size of extents for the Clip AV stream file recorded in layer 0 shall be multiple of a hash unit.

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Annex B. Carriage of System Renewability Message

B.1 Introduction

This chapter describes the method to store the System Renewability Message (SRM) on the BD-ROM in the case where an SRM is to be stored on the BD-ROM.

B.2 SRM for DTCP

SRM for DTCP shall be stored as a file “DTCP.srm” in the root directory.

B.3 SRM for HDCP

SRM for HDCP shall be stored as a file “HDCP.srm” in the root directory.

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Annex C. Requirements for On-line and Managed Copy API

This annex defines requirements and recommendations for On-line and Managed Copy APIs at BD-J specific aspect, in addition to Chapter 4 and Chapter 5 of this specification.

C.1. PSR31 value and VFS capability / BD-J network connectivity

Player Status Register 31 (PSR31) includes 4-bit Player Profile at the position of bit16~19. Content shall cause the player to check player's VFS capability and BD-J network connectivity by referring to Player Profile.

Following table explains the relationship between Player Profile value and VFS capability / BD-J network connectivity.

0000 ₂ and 1000 ₂ :	Player Profile for the player that does not have VFS capability nor BD-J network connectivity
0001 ₂ :	Player Profile for the player that has VFS capability, but does not have BD-J network connectivity
0011 ₂ :	Player Profile for the player that has both VFS capability and BD-J network connectivity

(Other values are reserved)

Note: Implementation of AACS On-line function is mandatory for all Licensed Players that has BD-J network connectivity. However, the capability of storing Cacheable Permission (i.e. Secure Clock implementation) is optional for such kind of Licensed Player. The existence of compliant AACS On-line API implementation shall be checked by referring to system property value defined in C.2 because the Licensed Player with Player Profile "0011₂" developed before this revision might not implement AACS On-line function.

C.2. System property and API implementation

C.2.1. System Property

The System Property for AACS On-line and Managed Copy API is defined as follows.

Other property names with prefix "aacs.bluray." are reserved for future use.

- aacs.bluray.online.capability = YES | NO

This means that System.getProperty("aacs.bluray.online.capability") in BD-J Application returns the value according to the requirement defined in C.2.2.

- aacs.bluray.mc.capability = "A", "B", "C", "AB" or "AC" | NO

This means that System.getProperty("aacs.bluray.mc.capability") in BD-J Application returns the value according to the requirement defined in C.2.3.

C.2.2. Implementation requirement for On-line

The following table describes the rules for AACCS On-line API related player implementation.

Table C-1 System Property and API implementation for AACCS On-line

	System Property (aacs.bluray.online.capability = YES NO)	API implementation
Player Profile = 0000 ₂ , 0001 ₂ , or 1000 ₂	NO (*1)	Recommended to implement AACCS On-line API stubs to return at least dummy values
Player Profile = 0011 ₂	YES	Required to implement AACCS On-line API correctly.

(*1) Note: The Licensed Player developed before Revision 0.912 might not implement this property. They may throw SecurityException as a response for unknown system property request.

C.2.3. Implementation requirement for Managed Copy

The following table describes the rules for AACS Managed Copy API related player implementation.

Table C-2 System Property and API implementation for AACS Managed Copy

	System Property (aacs.bluray.mc.capability = "A", "B", "C", "AB" or "AC" (*2) NO)	API implementation
Player which does not support Managed Copy	NO (*1)	IsMCMSupported() shall be implemented to return false. (Recommended to implement other AACS Managed Copy API stubs to return at least dummy values.)
Player which supports Managed Copy	"A", "B", "C", "AB" or "AC" (*2)	Required to implement AACS Managed Copy API correctly.

(*1) Note: The Licensed Player developed before Revision 0.912 might not implement this property. They may throw SecurityException as a response for unknown system property request.

(*2) Note: The Licensed Player shall return the value according to the type of MCM. In the case of the Licensed Player which implements a Type A MCM, it shall return "A". In the case of the Licensed Player which implements both a Type A and C MCM, it shall return "AC". Licensed Players are prohibited from implementing both a Type B and C MCM because Type B and C cannot coexist in one device.

C.2.4. Player Implementation options for VFS, On-line and Managed Copy

The following table describes the options for Player capability and the related indication method to check the Player implementation.

Table C-3 Player Implementation options for On-line and Managed Copy

Option	VFS (for BDMV and AACS files)	BD-J Network Connectivity	AACS Online APIs
1	NO	NO	NO
2	YES	NO	NO
3	YES	YES	YES
Indication Method	YES : Player Profile = 0001 ₂ or 0011 ₂ NO: Player Profile (others)	YES : Player Profile = 0011 ₂ NO: Player Profile (others)	SystemProperty (aacs.bluray.online.capability)

Note: Capability for Managed Copy is independent from other implementation options described in this table, and shall be checked by referring System Property (aacs.bluray.mc.capability).

C.3. Consideration for the use of com.aacsla.bluray package

The following requirements are applied for the content and player implementation to consider the use of com.aacsla.bluray package.

Requirement for content:

BD-J Applications shall not define classes in “com.aacsla.bluray” package. The fully qualified class name of any class defined by an application shall not start with “com.aacsla.bluray”.

BD-J Applications shall not use or reference API elements of “com.aacsla.bluray” that are not defined in *AACS Blu-ray Disc Pre-recorded Book*.

Requirement for Players:

BD-ROM Terminals shall protect the overriding of APIs in “com.aacsla.bluray” package by using the `SecurityManager.checkPackageDefinition` mechanism.

C.4. Method to check the player’s capability by content

C.4.1. Method to check the player’s AACS On-line capability

To avoid the compatibility problem, it is strongly recommended for a BD-J Application to implement a check of the player’s capability of supporting AACS On-line APIs, before it calls AACS On-line APIs. The following steps are an example of this capability check.

1. Read PSR31 value and check that Player Profile is 0011₂.
2. Check that the return value of `System.getProperty(“aacs.bluray.online.capability”)` is “YES”.
(Note 1): `System.getProperty()` may throw `SecurityException`. It is strongly recommended that the BD-J Application catch this exception and treat it as no AACS On-line capability.
(Note 2): This check shall be done in addition to PSR31 check because the Licensed Player with Player Profile “0011₂” developed before this revision might not implement the AACS On-line function.
3. If the checks in step 1 and step 2 succeed, call the AACS On-line APIs.

C.4.2. Method to check the player’s AACS Managed Copy capability

To avoid the compatibility problem and eager linking problem, a separate BD-J Application is required to check the player’s capability of supporting AACS Managed Copy before it launches another BD-J Application to use the AACS Managed Copy APIs. The following steps are an example of capability check.

1. Check that the return value of `System.getProperty(“aacs.bluray.mc.capability”)` is “A”, “B”, “C”, “AB” or “AC”.
2. If the value includes the character “B” or “C”, launch another BD-J Application which calls AACS Managed Copy APIs according to the type of MCM. Note that the BD-J Application shall not call AACS Managed Copy APIs for a Type A MCM.

Warning: The application which checks the capabilities using the system property shall not itself call any APIs defined in Section 5.2 of this specification, to avoid the eager linking problem.