

INTERNATIONAL STANDARD

Multimedia home server systems – File allocation system with minimized
reallocation

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IEC 62842:2015

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MULTIMEDIA HOME SERVER SYSTEMS – FILE ALLOCATION SYSTEM WITH MINIMIZED REALLOCATION

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International Standard IEC 62842 has been prepared by technical aerea 8: Multimedia home systems and applications for end-user network of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical report is based on the following documents:

CDV	Report on voting
100/2367/CDV	100/2459/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

Recently, hard disk and Blu-ray Disc¹ recorders have become popular in the home to record television programmes. Normally a Hard Disk Recorder (HDR) is used for time shift and a Blu-ray Disc (BD) is used for library. When an HDR is used for time shift, television programmes are recorded and played, then many of them are deleted to reuse the spaces for other programmes to be recorded. These programmes are stored as files in a hard disk drive (HDD) using a file system. Continuous recording and deletion of programmes involves the continuous storing and deletion of files in the file system. Television programme streams include at least videos and an electronic programme guide (EPG). The HDR stores videos in a long, variable length file depending on the quality and recording hours. Compared with videos, EPG related information is stored in a shorter file or files but is often updated. This continuous creation, deletion and updating of files of different lengths finally causes the files to be stored in fragments, and the system performance becomes very low.

In a computer, defragmentation tools are provided to solve the problem of a fragmented file system. Normally defragmentation with reallocation of files in sequence takes a long time and the end user cannot but wait for the completion of the defragmentation, with no other activity. In the home server environment, a smarter solution to resolve this problem needs to be provided.

The recent newly developed HDD features will be reflected in the next version of the standard.

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¹ Blu-ray Disc™ is a trademark of the Blu-ray Disc Association. This information is given for the convenience of users of this document and does not constitute and endorsement by IEC of the product named.

MULTIMEDIA HOME SERVER SYSTEMS – FILE ALLOCATION SYSTEM WITH MINIMIZED REALLOCATION

1 Scope

This International Standard specifies the method for allocating requested file space with no fragmentation, to minimize the need for reallocation of fragmented files in the Universal Disc Format (UDF) file system applied to hard disk drives used in hard disk recorders.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 13346 (all parts), *Information technology – Volume and file structure of write-once and rewritable media using non-sequential recording for information*

ISO/IEC 13346-1:1995, *Information technology – Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange – Part 1: General*

ISO/IEC 13346-3:1999, *Information technology – Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange – Part 3: Volume structure*

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ISO/IEC 13346-4:1999, *Information technology – Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange – Part 4: File structure*

OSTA UDF2.01:200, *Information technology – OSTA Universal Disk Format Specification, Revision 2.01*

Secure Universal Disk Format Specification Revision 1.00, *Optical Storage Technology Association (OSTA)*, <http://www.osta.org/>

3 Terms, definitions, abbreviations and notation

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1 partition

region allocated to a file system by a disk volume space management system

3.1.2 virtual container partition

virtual partition containing a partition which has a minimum size of power-of-2 of allocation unit size of the disk

3.1.3

buddy

region allocation method where a given region having a power-of-2 unit size is recursively divided into two equal size regions (as 'buddies') until it reaches to one unit in size and, if a region of a given size is requested, the smallest free power-of-2 unit size region that can contain the requested size region is allocated

3.1.4

Concatenation of power of 2

CoPo2

basic allocation method of this standard

3.1.5

divide

process of obtaining divided-partitions through first identifying master-divided partitions, then applying the buddy method to them to get divided-partitions and finally allocating divided-partition numbers

3.1.6

master-dividing

process of identifying the master-divided-partition in the first process of dividing

Note 1 to entry: When the size of a partition is a power-of-2 unit size, the partition as a whole constitutes a master-divided partition.

Note 2 to entry: When the size of a partition is expressed as the sum of mutually different power-of-2 sizes with the power-of-2 size that constitutes the sum, constitute the partition as a concatenation of the areas in the sequence of those sizes as master-divided partitions in decreasing order of size.

3.1.7

master-divided-partition

divided partition identified by master-dividing

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3.1.8

one unit in size

predetermined minimum unit of memory size that can be allocated

3.1.9

divided-partition

partition identified by dividing the master-divided partitions in a given partition recursively in half until it reaches one unit in size

3.1.10

divided-partition level

level value of a divided-partition expressed by the power-of-2 value of the divided partition compared to unit size

Note 1 to entry: This is often abbreviated as level n (where n specifies level number).

3.1.11

partition level

level n

abbreviation of divided-partition level, normally used in a simple form, 'level n'

3.1.12

divided-partition pair

pair of divided-partition formed by dividing a divided-partition into two halves as buddies

3.1.13**divided-partition number**

number assigned to divided-partitions in the process of dividing a given partition from top level to the lowest level incrementally

Note 1 to entry: Numbers are assigned to each divided-partition from top to bottom and from left to right in the same level with the starting number 1, counting up by one.

3.1.14**master-divided-partition number**

divided-partition number assigned to each master-divided-partition

3.1.15**master-divided partitions table**

table for managing the master-divided partitions

3.1.16**master-divided-partition number management table**

table for managing the master-divided-partition number in contrast with each divided-partition level

3.1.17**end position management table**

table for managing the maximum divided-partition number assigned in each divided-partition level

3.1.18**highest divided-partition level management table**

table for managing the highest divided-partition level for the partition

3.1.19**multilevel-divided partition management tables**

three tables for managing the divided-partitions

Note 1 to entry: The three tables are the master divided-partition number management table, the end position management table and the highest divided-partition level management table.

3.1.20**multilevel-divided-partition allocation table**

table for managing the multilevel-divided partitions state in each level with 2 bits

3.1.21**segment**

region to be taken or allocated from a partition

Note 1 to entry: If the size of a region is power-of-2 unit size, the region consists of one divided partition.

Note 2 to entry: If the size of a region is a sum of polynomials of power-of-2 of a unit size, the region consists of a concatenation of multilevel divided-partitions, each corresponding to one polynomial component, and it is taken from the container divided-partition for a segment.

3.1.22**multilevel-dividing**

procedure for obtaining a region as a segment, consisting of the concatenation of multilevel divided-partition decreasing order in size, of which each corresponds to one power-of-2 polynomial component

3.1.23

container divided partition for a segment

simple power-of-2 region determined by rounding up the size of a polynomial-based requested segment to the size of the nearest simple power-of-2 region and that simple region will consist of the segment to be allocated and adjacent-multilevel-segment

3.1.24

adjacent-multilevel-segment

segment adjacent to the allocated multilevel-segment of which each component divided-partition is allocated in increasing order of size, and which constitutes the rest of the container divided-partition for a segment

3.1.25

first-pass-allocation

first step to allocate a segment, to obtain a minimum divided partition including the requested segment

Note 1 to entry: If a segment is a single level divided-partition, the allocation is completed, but if a segment is multilevel, the process continues to a second-pass allocation.

3.1.26

second-pass-allocation

second step to allocate a multilevel segment, in a segment allocation, where the multilevel-dividing is applied to the divided-partition obtained from the first-pass-allocation

3.1.27

provisional-allocation

procedure to get a segment, where, if a divided-partition including the target segment is not found, a search for the available upper level of a divided-partition is requested and the divided-partition found is allocated as provisional allocation

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Note 1 to entry: After getting a provisional divided-partition, first-pass-allocation continues and in the case of allocating a multilevel-segment, second-pass-allocation continues.

3.1.28

allocation state

divided-partition state in view of allocation, classified into available, occupied and reserved

3.1.29

available

allocation state showing the divided-partition is free to use, meaning available

Note 1 to entry: Divided-partitions are classified into first-pass-available and second-pass-available. When searching for a free divided-partition, start by searching for first-pass-available and then search for second-pass-available.

3.1.30

first-pass-available

initial available state assigned to free divided-partitions

Note 1 to entry: When an occupied divided-partition becomes free, its allocation state is set as first-pass-available.

3.1.31

second-pass-available

available allocation state assigned to each component divided-partition of adjacent-multilevel-segments, after allocation of the multilevel-segment

3.1.32

occupied

allocation state showing the divided-partition is in use