IEC/TR 62291

Edition 2.0   2009-02

TECHNICAL REPORT

Multimedia data storage – Application program interface for UDF based file systems

IEC/TR 62291:2009(E)

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC/TR 62291

Edition 2.0   2009-02

TECHNICAL REPORT

Multimedia data storage – Application program interface for UDF based file systems

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE   **Q**

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION
_____

MULTIMEDIA DATA STORAGE –
APPLICATION PROGRAM INTERFACE
FOR UDF BASED FILE SYSTEMS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.

3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.

4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.

5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.

6) All users should ensure that they have the latest edition of this publication.

7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.

8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC 62291, which is a technical report has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition, published in 2002, and constitutes a technical revision.

The significant changes with respect to the first edition are the following:

• reference document ISO/IEC 9945-1:1990 is replaced with ISO/IEC 9945-2:2003.

• reference document UDF 2.00 is replaced with UDF 2.01.

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

Enquiry draft	Report on voting
100/1452/CDV	100/1499/RVC

Full information on the voting for the approval of this technical report 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 maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

• reconfirmed,
• withdrawn,
• replaced by a revised edition, or
• amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Interchangeable storage media have been widely employed for information interchange; the following extensions to their media format should therefore be standardized:

a) additional facilities including security (access control, originality management, etc.);

b) volume and file structure supporting the facilities;

c) API (Application Program Interfaces) to the volume and file structure.

For a number of disc media, ISO/IEC JTC1/SC15 developed a generic standard of volume and file structure and it was actually used for rewritable, recordable and read-only DVD and recordable CD file systems with some subsetting by OSTA (Optical Storage Technology Association). The subsetting specification is called a UDF (Universal Disk Format).

Additional facilities and an API for the UDF have been discussed in OITDA (Optoelectronic Industry and Technology Development Association). OITDA drafted their specifications and submitted them to JISC (Japanese Industrial Standard Committee). METI (Ministry of Economy, Trade and Industry, Japan) approved them and JSA (Japanese Standards Association) published them in July 2001 as

a) JIS/TR X 0040:2001 Security Extension to Universal Disk Format (UDF);

b) JIS/TR X 0041:2001 Application Program Interface for UDF based File Systems.

IEC/TC100 National Committee of Japan then submitted the English version of JIS/TR X 0041:2001 to IEC/TC100.

**MULTIMEDIA DATA STORAGE –
APPLICATION PROGRAM INTERFACE
FOR UDF BASED FILE SYSTEMS**

1   Scope

This Technical Report (TR) specifies an application program interface (API) for reading and writing the files which conform to the Universal Disk Format (UDF) ®[1] specification revision 2.00 developed by the Optical Storage Technology Association (OSTA) and its security extension.

2   Normative references

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

ISO/IEC 9945-2:2003, *Information technology – Portable Operating System Interface (POSIX) – Part 2: System Interfaces*

Universal Disk Format (UDF) *Specification* Revision 2.01, Optical Storage Technology Association (OSTA), 2000

Secure UDF, Revision 1.00, OSTA, 2002

JIS/TR X 0040:2001, *Security Extension to Universal Disk Format (UDF)*

NOTE   JIS/TR X 0040 was translated into English under the title *Secure UDF Specification* (2002), see reference above.

3   Terms and definitions

For the purposes of this technical report, the following definitions apply.

**3.1
access logging**
security feature to record and refer to operations for each file; an access logging contains information on when the operation is applied, who applies the operation, and what type of operation is applied

**3.2
security function**
function that ensures that an implementation applies to each file when the implementation accesses to the files

NOTE   A security function contains access logging, etc.

---

[1]   Universal Disk Format (UDF) is a registered trademark developed by the Optical Storage Technology Association. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

3.3
usage environment
environment in which use of contents is allowed

NOTE An example of the environment is a combination of specific storage medium, specific storage device and specific decoder.

3.4
usage environment identifier
identifier for distinguishing a specific usage environment with other usage environments

NOTE A storage medium identifier can be used as a usage environment identifier.

3.5
license
encrypted decryption key for encrypted contents, i.e., a default stream and user streams

3.6
secure UDF
Universal Disk Format (UDF) that contains the structures specified by JIS/TR X 0040 (or OSTA Secure UDF, Revision 1.00)

4   Notation

The conventions for symbol constants that are returned by functions as error numbers conform to the description on "error numbers" in 2.3 of ISO/IEC 9945-2:2003.

5   File operations conforming to ISO/IEC 9945-2

The file operations in Table 1 conform to the system interfaces specified by ISO/IEC 9945-2:2003.

Table 1 – File operations conforming to ISO/IEC 9945-2

ISO/IEC 9945-2 Clause	Operation	Function name
3	Directory Operations	opendir() readdir() rewinddir() closedir()
3	Change Current Working Directory	chdir()
3	Working Directory Pathname	getcwd()
3	Open a File	open()
3	Create a New file or Rewrite an Existing One	creat()
3	Set File Creation Mask	umask()
3	Link to a File	link()
3	Make a Directory	mkdir()
3	Make a FIFO Special File	mkfifo()
3	Remove Directory entries	unlink()
3	Remove a Directory	rmdir()
3	Rename a File	rename()
3	Get File Status	stat() fstat()
3	File Accessibility	access()
3	Change File Modes	chmod()
3	Change Owner and Group of a File	chown()
3	Sets File Access and Modification Times	utime()
3	Close a File	close()
3	Read from a File	read()
3	Write to a File	write()
3	File Control	fcntl()
3	Reposition Read/Write File Offset	lseek()

6   UDF specific file operations

This clause specifies UDF specific file operations.

6.1   Header and data structure

6.1.1   General

The udf.h header file includes the structure definitions that are dealt with in UDF file systems. For information about each structure definition, see the UDF Specification revision 2.01.

6.1.2   File entry structures in udf.h

The udf.h header file defines the udfent UDF file entry structures that are returned by the udfgetent() function. Tables 2 to 5 list the definitions of related structures.

Table 2 – udfent structure

Member type	Member name	Description
Udftag	desc_tag	Tag ID of descriptors (261 for basic files and 266 for extension files)
Uint32	Uid	User ID of file owner
Uint32	Gid	Group ID of file owner
Uint32	Perm	Access permission
Uint16	file_link_cnt	Number of file links
Uint8	Rec_fmt	Record format
Uint8	rec_disp_attr	Record display attribute
Uint32	Rec_len	Record length (bytes)
Uint64	info_len	File length (bytes)
Uint64	Obj_size	File length including all streams (bytes)
Uint64	lblk_rec	Number of logical blocks recorded
timestamp	Acstime	Time of last file access
timestamp	Modtime	Time of last file modification
timestamp	Crttime	Time of file creation
timestamp	Atrtime	Time of last file attribute modification
Uint32	checkpoint	Checkpoint
regid	impl_id	Implementation ID
Uint64	uniq_id	Unique ID

Table 3 – udftag structure

Member type	Member name	Description
Uint16	Tag_id	Tag ID
Uint16	desc_ver	Descriptor version
Uint8	Tag_chksum	Checksum of the udftag structure
Uint8	Pad1	Reserved (#00)
Uint16	Tag_serno	Descriptor group ID
Uint16	desc_crc	CRC of the descriptor
Uint16	desc_crc_len	Length of CRC
Uint16	Tag_loc	Location of the descriptor (logical block number)