All approved UDF 2.60 DCNs

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Base Document:	OSTA Universal Disk Format Specification (UDF)
Document:	All approved DCNs leading to UDF revision 2.60
Date:	February 28, 2005

Purpose of this document:

This document contains all UDF Document Change Notices (DCNs) as approved by the OSTA UDF File Interchange Committee when going from UDF revision 2.50 to 2.60. Note that some of theses DCNs are also part of the UDF 2.50 errata document.

History of this document:

28-02-2005: Created this document with DCN-5100 thru DCN-5122.

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OSTA UDF DCN status - DCNs after UDF 2.50 and for UDF 2.50 errata

Official DCN#	UDF 2.50 errata	Status/Date of approval dd-mm-yyyy	Date of issue dd-mm-yyyy	Title
5100	No	Closed 25-01-2005 28-02-2005	15-09-2003	Editorial corrections for UDF revision after UDF 2.50 Closed when UDF 2.60 voting document was issued Final editorial corrections approved February 28, 2005
5101	Yes	14-06-2004	08-06-2004	Virtual, metadata and read-only partitions on one volume
5102	Yes	08-12-2003 28-02-2005	16-09-2003	No Metadata Bitmap File required for read-only partition Adaptions effecting UDF 2.50 errata only, see DCN-5122
5103	Yes	08-12-2003	16-09-2003	Equivalence for Metadata File and Metadata Mirror File
5104	Yes	14-09-2004	16-09-2003	Next extent for Metadata File and Metadata Mirror File
5105	Yes	08-12-2003	16-09-2003	Terminating Descriptor in Metadata Partition
5106	Yes	08-12-2003	25-09-2003	Metadata Mirror File FEs and AEDs always far apart
5107	Yes*	04-11-2004	25-09-2003	Clarify overlapping of Sparing Table with a partition
5108	Yes*	14-09-2004	03-10-2003	Descriptor CRC Length Uint16 overflow rules
5109	Yes	08-12-2003	02-10-2003	Clarification of NOTE on page 41
5110	Yes*	14-09-2003	16-08-2004	Appoint OS Identifier for UNIX - NetBSD
5111	No	04-11-2004	13-09-2004	Pseudo OverWrite Method
5112	Yes	25-01-2005	17-01-2005	BD non-POW media recommendations for UDF 2.50
5113	Yes	04-11-2004	09-09-2004	Main and Reserve VDS far apart
5114	No	25-01-2005	17-01-2005	BD-R recommendations for UDF 2.60
5115	Yes	04-11-2004	14-10-2004	Enable UDF 2.50 POW read compatibility
5116	No	04-11-2004 28-02-2005	14-10-2004	Consequences of Pseudo OverWrite Method Adaptions for consistent input text from DCN-5102
5117	No	04-11-2004	18-10-2004	Common aspects of recording for different media (Editorial modification on December 12, 2004)
5118	No	04-11-2004	25-10-2004	Clarify location of Partition Header Descriptor
5119	Yes	04-11-2004 28-02-2005	26-10-2004	Zero Information Length for Non-Allocatable Space Stream Added to UDF 2.50 errata, see DCN-5122
5120	No	06-12-2004	05-11-2004	Minimum UDF Read Revision for UDF 2.60 media
5121	Yes*	06-12-2004	03-12-2004	Clarification of Directory bit in parent FID
5122	Errata only	28-02-2005	12-11-2004	Make UDF 2.50 identical to UDF 2.60 for non-POW

Yes** means: Also relevant for UDF revisions prior to UDF 2.50, see DCN for details.

Document: OSTA Universal Disk Format	DCN-5100
Subject: *Editorial corrections for UDF revision after UDF 2.50*	
Date: September 15, 2003. Last update, February 28, 2005	

Description:

In this DCN, all editorial corrections are listed.

After approval by email votes of the UDF 2.60 document that was made available on January 26, 2005, some final editorial corrections were discussed and approved in the OSTA UDF committee meeting of February 28, 2005. See the update dated February 28 at the end of this DCN. The official OSTA UDF 2.60 document will be dated March 1, 2005.

Date:	September 15, 2003
Source:	Gerrit Scholl

In 1.3.2 replace: C/DVD
         by: CD/DVD

In 2.2.6, replace: extend_ad
         by: extent_ad

In 2.2.10 and 4.2.2.1.5 replace: … of of …
         by: … of (the)…

In 2.2.10, extra indent for:
- Flags = 0
- Identifier = *UDF Metadata Partition
- IdentifierSuffix is recorded as in section 2.1.5

In 2.2.11, remove indent on page 37 for:

Number of Files - Defined in 2.2.6.4. The contents of this field shall be used instead of the corresponding LVID field.

Number of Directories - Defined in 2.2.6.4. The contents of this field shall be used instead of the corresponding LVID field.

Date:	October 03, 2003
Source:	Gerrit Scholl

In 3.3.7.2 at the very end of page 89
replace: bit 10 of ICB flags field
    by: bit 10 of ICBtag flags field

Add note to 2.2.1 and 2.3.1:

NOTE: The value zero for TagIdentifier is not defined by ECMA, but it is used by UDF for the Sparing Table.

In 2.1.3 replace: 7.2.12
           by: 1/7.2.12

In 6.12 heading replace: **… DVD-R/-RW/RAM …**
              by: **… DVD-R/-RW/-RAM …**

In 2.2.7 heading replace: **Implemention …**
              by: **Implementation …**

Date:	October 06, 2003
Source:	Gerrit Scholl

*In **2.2.6 Logical Volume Integrity Descriptor***
replace: Uint32   LengthOfImplementationUse,
   by: Uint32   LengthOfImplementationUse,   /* = L_IU */

*and in the table of **2.2.6.4 byte ImplementationUse[]***
 replace: ??
     by: L_IU – 46

Date:	June 28, 2004
Source:	Gerrit Scholl

In 6.9.2.2 and 6.13.1, check use of 'n' where it should be 'N'.

In the last line of 2.2.11
replace: Number of entries (N) = (Information Length - L_HD) / 4.
     by: Number of entries = (Information Length - L_HD) / 4.

In 3.3.4.5 and 3.3.4.6
replace: C source code for the header checksum may be found in the appendix.
     by: C source code for the header checksum is found in appendix 6.8.

In 3.3.4.4 replace: Uint32 **MajorDeviceIdentification**;
                      Uint32 **MinorDeviceIdentification;**
           by: Uint32 MajorDeviceIdentification;
                      Uint32 MinorDeviceIdentification;

In 3.3.4.4, the paragraph starting with:
     As the first structure in the *ImplementationUse* field, ….

*becomes section **3.3.4.4.1**:*

3.3.4.4.1 ImplementationUse[IU_L]
As the first structure in the *ImplementationUse* field, ….

Section number not italic: <mark>{section deleted}</mark>
replace: **6.13.1.4**
    by: **6.13.1.4**

In 4.1 and 6.7 replace: *LogicalVolumeID*
                    by: *LogicalVolumeIdentifier*
    and in 6.7 replace: *FileSetID*
                    by: *FileSetIdentifier*
In 4.1 add to dotted list:
          • *FileSetIdentifier*

In 4.1 replace: C source code for the translation algorithms may be found in the
            appendices of this document.
    by: C source code for the translation algorithms is found in appendix 6.7.

In 2.3.4.2 replace: See [4/14.4.3], note 21 and [4/14.4.5].
            by: See ECMA 167 4/14.4.3 note 21 and 4/14.4.5.

In 2.3.10 replace: For a Logical Volume that resides on a single Logical Volume …
            by: For a Logical Volume that resides on a single Volume …

In 2.2.4.2 replace: … within a VolumeSet …
            by: … within a Volume Set …

Date:	August 31, 2004
Source:	Gerrit Scholl

*In **3.2.1.1** replace (font color):*   … The parent references …
                                  by: … The parent references …

Date:	October 28, 2004
Source:	Gerrit Scholl

Where relevant, replace: link count
             by: File Link Count

Where relevant, replace: FileSet
             by: File Set

Editorial change in the DCN-5108 document:
Instead of copying identical text to the sections 2.2.1.2 and 2.2.1.3,
the text of 2.3.1.2 is replaced by a reference to 2.2.1.2 as follows:
Replace the complete text of 2.3.1.2 by:

The same applies as for volume structure *DescriptorCRCLength* values, see 2.2.1.2.

Subject:	*Change 2.50 to 2.60 on several places*
Date:	November 10, 2004
Source:	Gerrit Scholl

Special case:
In 6.9.1 replace:
NOTE: DVD-Video discs mastered according to UDF 2.50 may not be compatible with DVD-Video players. DVD-Video players expect media in UDF 1.02 format.

by:
NOTE: DVD-Video discs mastered according to a UDF revision unequal to 1.02 may not be compatible with DVD-Video players. DVD-Video players expect media in UDF 1.02 format.

In DCN05116 replace:

Reserved track   A *reserved* track is a track that has a valid Next Writable Address. For Pseudo OverWrite, this means that sequential write and pseudo overwrite to this track is possible until the NWA.

by:

Reserved track   A *reserved* track is a track that has a valid Next Writable Address (NWA). For Pseudo OverWrite, this means that sequential write at the NWA and pseudo overwrite until the NWA is possible for this track.

Subject:	*Check Developer Registration form*
Date:	November 26, 2004; modified December 21, 2004
Source:	Gerrit Scholl

The developer registration form will be extracted from the UDF 2.60 specification and then posted on the OSTA site as a separate pdf document

In 2.1.5.2, reorganize the text below the table.
1) *move paragraph* "The *Suffix Type* column …" up, directly below the table.
2) *Move Note about "*Application ID" below the next note and change it to plain text instead of a note (like for "*Developer ID").*
3) *Number the remaining 3 notes as Note 1. Note 2 and Note 3.*
4) *Add to 1.1:* Notes may be numbered "**NOTE 1:**", etc.

In 6.16 Developer Registration Form after bullet list add:

Note 2 in section 2.1.5.2 explains how a Developer ID should look like.

Updates in the Developer Registration Form itself:
Add:

O BD-ROM   O BD-RE   O BD-R
O HD DVD-ROM   O HD DVD-Rewritable   O HD DVD-R

Replace:

Please indicate what value you plan to use as the EntityID *"*Developer ID"* **to identify your implementation, see 2.1.5:**

NOTE: The Developer ID should be something that uniquely identifies your company as well as your product.

---

by:
Please indicate what value you plan to use as EntityID "*Developer ID" to identify your implementation. The Developer ID should uniquely identify your company as well as your product, see section 2.1.5.2 note 2 in the latest UDF specification.

And replace:
E-mail or fax completed form to OSTA. For address, see POINTS OF CONTACT on the first page of this document.

by:
Send completed form to OSTA. For address, see http://www.osta.org/osta/contact.htm.

Subject:	*Miscellaneous*
Date:	January 24, 2005
Source:	Gerrit Scholl

- Make the order of NOTES and text below the table of 2.1.5.2 more logical
- Check if ECMA is always referenced as "ECMA 167".
- Check use of "free space" and "unallocated space"
- Check consequent use of "Named Stream" instead of "stream"
- Use "terminating descriptor" instead of "termination descriptor"
- *Replace*: "Metadata Bitmap File Entry" *by:* "Metadata Bitmap File File Entry"
- *In 3.3.1.1.1 replace:* *"FileIdentifier structure" by: "File Identifier Descriptor"*
- *Replace*: "Identifer" *by:* "Identifier"
- *Replace*: "time stamp" *by:* "timestamp"
- *Replace*: "LogicalVolumeContentUse" *by:* "LogicalVolumeContentsUse"
- On December 21, 2004 DCN-5117 was modified and posted on the UDF reflector The sector size and ECC block size was not defined for DVD+R because it was in the wrong section. This change was handled as an editorial change.

In 2.2.12 *replace:* All mappings are one packet in length. The packet
　　　　　　　size is specified in the sparable partition map.
　　by: All mappings are one fixed packet or ECC block in length. The
　　　　　　Packet Length (in blocks) is specified in the Sparable Partition Map.

Inconsistent use of "File System" and "File Structure" in UDF.
According to ECMA 167, the "Volume Structure" and "File Structure" are parts of a file system. "Volume Structure" and "File Structure" are used as the title for ECMA 167, Part 3 and Part 4 respectively. UDF refers to these ECMA Parts as well, but uses "File System" as title for Part 4. This is confusing, also because in UDF also "File Structure" is used to refer to Part 4. Therefore UDF must also use "File Structure" as title for Part 4. Therefore:
change the title of sections 2.3, 3.3 and 4.2 as follows,
replace: Part 4 - File System
　　by: Part 4 - File Structure

and in 2.1.5.3 below the "Domain Flags" table,
replace: file system structures
　　by: file structures

In 2.2.13.1 below the first bullet list replace:

The *Information Length* field of the File Entries for these files shall be equal to (number of blocks described by the ADs for this stream * logical block size).

by:
The *Information Length* field of the File Entries for these files shall be equal to ((number of blocks described by the ADs) multiplied by logical block size).

Check medium type and partition type, medium type, etc. terminology:
for partition access types use:
        pseudo-overwritable, read-only, write-once, rewritable, overwritable

for POW method, use: Pseudo OverWrite method

for all other type cases (medium type, etc) use:
        Read-Only, Write-Once, Recordable, Rewritable, Overwritable
----

In the UDF spec there is no clear indication that the Logical Volume Integrity Sequence extent is the extent where LVIDs are recorded,

    so in: "2. Basic Restrictions & Requirements"
    row: "Logical Volume Integrity Descriptor"

replace: The extent of LVIDs …
    by: The Logical Volume Integrity Sequence extent of LVIDs …

Entity Identifier types terminology

Terminology concerning the 4 possible Entity Identifier types and corresponding Suffix Types as defined in 2.1.5 and used in 2.1.5.2 is not consequently used in 2.1.5.3, so in 2.1.5.3: unify and clarify the text above the 4 Identifier Suffix tables and point to 2.1.5.2 for suffix type determination.

The caption directly above the Identifier Suffix tables must be:

Domain Identifier Suffix format

UDF Identifier Suffix format

Implementation Identifier Suffix format

Application Identifier Suffix format

Further update 2.1.5.3 as follows:

Just above the "Domain Identifier Suffix" table

replace: In regard to OSTA Domain *Entity Identifiers* specified in this document (appendix 6.1) the …

by: In regard to OSTA *Domain Entity Identifiers* specified in this document (see 2.1.5.2 and appendix 6.1), the …

Just above the "UDF Identifier Suffix" table

replace: Implementation use *Entity Identifiers* defined by UDF (appendix 6.1) the …

by: For *UDF Entity Identifiers as* defined by UDF (see 2.1.5.2 and appendix 6.1),

the …

Just above the "Implementation Identifier Suffix" table

replace: For implementation use *Entity Identifiers* not defined by UDF the …

by: For *Implementation Entity Identifiers* not defined by UDF (see 2.1.5.2), the …

Just above the "Application Identifier Suffix" table

replace: For an *Application Entity Identifier* not defined by UDF, the …

by: For an *Application Entity Identifier* not defined by UDF (see 2.1.5.2), the …

*In the **Application Identifier Suffix** Table,*

replace the field name: Implementation Use Area

by: Application Use Area

Subject:	*Section 6.3. ECMA and DVD Forum address*
Date:	January 25, 2005
Source:	Gerrit Scholl

Replace: http://www.ecma.ch
    by: http://www.ecma-international.org/

Replace:
    DVD Format/Logo Licensing Corporation
    Shiba Shimizu Bldg. 5F
    2-3-11 Shibadaimon, Minato-ku
    Tokyo 105-0012
    Japan
    by:
    DVD Format/Logo Licensing Corporation
    Daimon Urbanist Bldg. 6F,
    2-3-6 Shibadaimon, Minato-ku,
    Tokyo, 105-0012 JAPAN

In section 6.3 add subsections 6.3.1 and 6.3.2 for OS Class and OS Identifier respectively (6.3.2 on a new page). Remove the text after the OS identifier table at the end of 6.3.2 and replace it by the following text in section 6.3 (before 6.3.1):

6.3 Operating System Identifiers

The following sections define the current allowable values for the *OS Class* and *OS Identifier* fields in the *Identifier Suffix* of Entity Identifiers, see 2.1.5.3.

For the most up to date list of values for OS Class and OS Identifier please see the most recent UDF specification. On the OSTA web site, information provided by ISVs who have sent a Developer Registration Form to OSTA can be found, see 6.18.

NOTE: If you wish to add to the OS Class and OS Identifier definitions in the next sections, please contact the OSTA UDF Committee Chairman or post your proposal on the OSTA UDF email reflector, see the OSTA address information listed in POINTS OF CONTACT on the first page of this document.

6.3.1 OS Class

The *OS Class* field will identify under which class of operating system the specified descriptor was recorded. The valid values for this field are as follows:
…

Subject:	*Final to-be-done issues.*
Date:	January 25, 2005
Source:	Gerrit Scholl

- Remove empty row in table on page 9
- Check in 2.1.5.3 if "UDF Revision" fields in "*Domain Identifier Suffix* format" and "*UDF Identifier Suffix* format" contain the new UDF revision (e.g. #0260 for UDF 2.60)
- Check front page Copyright notice (year -2005)
- Check table in chapter: UDF Media Format Revision History
- Check font colors and highlighted text!! No special font colors are used in the document, except for hyperlinks (www and mailto). (Font colors may be copy/pasted from DCNs. Be aware that "Select all" plus "Automatic font colors" removes also the blue color of hyperlinks (restore by recreation)).
- Add new words/terms to index word list. Much effort was paid here to improve the index. This was not done when creating UDF 2.50.
- Check OSTA contact address, etc. (links and e-mail address to: osta.org)
- Check OSTA UDF reflector procedures. Replace subscribe/unsubscribe procedure text in "POINTS OF CONTACT" section by a reference to the "UDF Email Reflector" link on OSTA ODF web page.
- Check Developers Registration Form (if changes then to OSTA web site too)
- ==
- Convert to final UDF 2.60 document:
- Accept all changes
- Remove "draft" on several places in text and footer
- Check date on front and next page (revision history) and in footer
- Convert to PDF layout (page boundaries).
- Check all strange and unintended page boundaries
- Regenerate final table of contents and index word list for PDF format.

Subject:	*Final editorial corrections after approval of UDF 2.60 document.*
Date:	February 28, 2005
Source:	Gerrit Scholl

In 2.1.6 and 2.3.1.1 replace: Tag Seria lNumber
by: Tag Serial Number

In 2.2.3, the text that is referenced in NOTE 2 was moved from the sections 6.10 and 6.13 to a common section 6.11.2, so change the references. Further, the last sentence of this note is moved to be the first sentence in order to stress what is meant with "above rules" (i.e. the rules in NOTE 1).

replace:

> **NOTE 2:** As specified in sections 6.10 and 6.13, unclosed sequential Write-Once media may have a single AVDP present at either sector 256 or 512. If on an unclosed disc a single AVDP is recorded on sector 256, any AVDP recorded on sector 512 must be ignored. Closed media shall conform to the above rules.

by:

> **NOTE 2:** Closed media shall conform to the above rules. As specified in section 6.11.2, unclosed sequential Write-Once media may have a single AVDP present at either sector 256 or 512. If on an unclosed disc a single AVDP is recorded on sector 256, any AVDP recorded on sector 512 must be ignored.

In 3.2.1.1 and 3.3.7.1.1, replace: NextUniqueID
by: Next UniqueID
and add to word index.

On page i, add a line that notifies these final editorial corrections like this was also done for the final official UDF 2.50 specification document.

replace:

2.60   January 26, 2005   Incorporates Pseudo OverWrite, DCNs 5100-5121

by:

2.60   January 26, 2005   Incorporates Pseudo OverWrite, DCNs 5100-5121
          March 1, 2005   Approved by committee vote. Minor editorial corrections.

Document: OSTA Universal Disk Format	**DCN-5101**
Subject: *Virtual, metadata and read-only partitions on one volume*	
Date: September 15, 2003; Modified December 8, 2003 and June 8, 2004	

Description:

Outcome of UDF Committee meeting September 15, 2003:

The intent of UDF 2.50 was to exclude the combination of a virtual and a metadata partition. It is assumed that a virtual partition is on a write once partition only, but that is not really defined in the UDF spec, so an explicit exclusion is needed.
Further "single partition" must be interpreted as "single Partition Descriptor", because a volume with a Metadata Partition always has already 2 partition maps.

Added on December 8, 2003 and June 8, 2004:
A Metadata Partition must be used for the overwritable partition in the special case of an overwritable partition and a read-only partition on one volume.

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Change:

In the first paragraph of 2.2.10 replace:

This partition map *shall* be recorded for volumes which contain a single partition having an access type of 1 (read only) or 4 (overwritable). It *shall not* be recorded in all other cases.

by:

A Metadata Partition Map *shall* be recorded for volumes that contain a single Partition Descriptor having an access type of 1 (read only) or 4 (overwritable) and do not have a Virtual Partition Map recorded in the LVD.
For the special case of two non-overlapping Partitions on one volume, one with an access type of read-only and one with an access type overwritable, there shall be a Metadata Partition Map associated with the overwritable partition.
A Metadata Partition Map *shall not* be recorded in all other cases.

In 2.2.13, third paragraph of page 40:

replace:

File Entries describing any other type of file data (including streams) shall use either "immediate" allocation, or LONG_ADs which shall reference the physical or sparable partition referenced by the metadata partition, to describe the data space of the file.

by:

File Entries describing any other type of file data (including streams) shall use either "immediate" allocation, or LONG_ADs which shall reference the physical or sparable partition referenced by the metadata partition map, to describe the data space of the file. In the special two partitions case mentioned in 2.2.10, with a read-only partition and an overwritable partition on one volume, the data space of the file or stream may also be located in the read-only partition.

<table>
<tr><td>**Document:**</td><td>OSTA Universal Disk Format</td><td>**DCN-5102**</td></tr>
<tr><td>**Subject:**</td><td colspan="2">*No Metadata Bitmap File required for read-only partition*</td></tr>
<tr><td>**Date:**</td><td colspan="2">September 17, 2003; last modified February 28, 2005</td></tr>
</table>

Description:

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.
Outcome of UDF Committee meetings of September 15, 2003 and February 28, 2005:
A Metadata Bitmap File and Space Bitmap shall not be recorded for a read-only partition.

Change:

In 2.2.10 2nd paragraph replace:

- Metadata Bitmap File Location = the address of of block containing the File Entry for the metadata bitmap file. This address shall be interpreted as a logical block number within the physical or sparable partition associated with this partition map (see above "Partition Number" field).

by:

- Metadata Bitmap File Location = the address of the block containing the File Entry for the Metadata Bitmap File. This address shall be interpreted as a logical block number within the physical or sparable partition associated with this partition map (see above "Partition Number" field). If the value of the Metadata Bitmap File Location field is equal to #FFFFFFFF, no File Entry for the Metadata Bitmap File is defined.

In 2.2.13, replace:

When a Type 2 Metadata Partition map is recorded, the Metadata File, Metadata Mirror File and Metadata Bitmap File shall also be recorded and maintained.

by:

When a Type 2 Metadata Partition map is recorded, the Metadata File, Metadata Mirror File and Metadata Bitmap File shall also be recorded and maintained. The sole exception is that a Metadata Bitmap File shall not be recorded for a read-only partition.

In 2.2.13 at the bottom of page 40 replace:

Logical blocks allocated to the Metadata or Metadata Mirror Files shall be marked as allocated in the partition unallocated space bitmap, therefore a mechanism to determine available blocks within the metadata partition is needed. This is accomplished through the Metadata Bitmap file.

by:

Logical blocks allocated to the Metadata or Metadata Mirror Files shall be marked as allocated in the partition unallocated space bitmap, therefore a mechanism to determine available blocks within the metadata partition is needed. This is accomplished through the Metadata Bitmap File. A Metadata Bitmap File shall not be recorded for a read-only partition.

On page 42 replace:

  • An unused block marked free in the Metadata Bitmap File.

by:

  • An unused block that is available for use.

At the end of 2.3.3 Partition Header Descriptor
add a note:

NOTE 2: A Space Table or Space Bitmap shall not be recorded for a read-only partition or for a file system using a VAT.

Document: OSTA Universal Disk Format	**DCN-5103**
Subject: *Equivalence for Metadata File and Metadata Mirror File*	
Date: September 16, 2003	

Description:

Outcome of UDF Committee meeting September 15, 2003:
This DCN describes the clarification about equivalence between Metadata File and it's Mirror File. Unused logical blocks in Metadata File and it's Mirror File do not need to be identical.

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Change:

In **2.2.13 Metadata Partition**

Replace at the first sentence in 6ᵗʰ paragraph on page 40:

If the *Duplicate Metadata Flag* is set in the Metadata Partition Map *Flags* field, the Metadata Mirror File shall be maintained dynamically so that it contains identical data to the Metadata File at all times.

by:

If the *Duplicate Metadata Flag* is set in the Metadata Partition Map *Flags* field, the Metadata Mirror File shall be maintained dynamically so that it contains identical contents to the Metadata File at all times. Unused logical blocks in the Metadata File and Metadata Mirror File may not be identical.

Document: OSTA Universal Disk Format   **DCN-5104**
Subject: *Next extent for Metadata File and Metadata Mirror File*
Date: September 16, 2003; modified September 14, 2004.

Description:
Outcome of UDF Committee meeting September 15, 2003 and September 14, 2004:
The requirements for the Allocation Descriptors in File Entry of Metadata File and
Metadata Mirror File are amended, see 2.2.13.1.
- For 2nd bullet, type "next extent of allocation descriptors" is also allowed.
- For 3rd bullet, the extent length is described in bytes instead of logical blocks and the rule is not valid for extent type "next extent of allocation descriptors".
- For 4th bullet, the rule only makes sense for extent type "recorded and allocated".

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Change:

In **2.2.13.1 Metadata File (and Metadata Mirror File)**
replace last 3 bullets of first bullet list:

- …
- Either be of type "allocated and recorded" or type "not allocated".
- Have an extent length that is an integer multiple of the *Allocation Unit Size* specified in the Metadata Partition Map.
- Have a starting logical block number which is an integer multiple of the *Alignment Unit Size* specified in the Metadata Partition Map.

by:

- …
- Not specify an extent of type "not recorded but allocated".
- Extents of type "recorded and allocated" or "not allocated" shall have an extent length that is an integer multiple of (*Allocation Unit Size* multiplied by logical block size). The *Allocation Unit Size* is specified in the Metadata Partition Map.
- Extents of type "recorded and allocated" shall have a starting logical block number that is an integer multiple of the *Alignment Unit Size* specified in the Metadata Partition Map.

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Document: OSTA Universal Disk Format   **DCN-5105**
Subject: *Terminating Descriptor in Metadata Partition*
Date: September 16, 2003

Description:

Outcome of UDF Committee meeting September 15, 2003:
Terminating Descriptor may be recorded within Metadata Partition as a terminator in File Set Descriptor Sequence. Further the last bullet in the 2nd bullet list of 2.2.13.1 should not refer to the Metadata Bitmap File, because it may not be present for a read-only partition (see DCN-5102).

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Change:

In **2.2.13.1 Metadata File (and Metadata Mirror File)**

Replace:

The Allocation Descriptors for this file shall describe only logical blocks which contain one of the below data types. No user data or other metadata may be referenced.
- FSD
- ICB
- Extent of Allocation Descriptors (see 2.3.11).
- Directory or stream directory data (i.e. FIDs)
- An unused block marked free in the Metadata Bitmap File.

By to add Terminating Descriptor:

The Allocation Descriptors for this file shall describe only logical blocks which contain one of the below data types. No user data or other metadata may be referenced.
- FSD
- <u>Terminating Descriptor</u>
- ICB
- Extent of Allocation Descriptors (see 2.3.11).
- Directory or stream directory data (i.e. FIDs)
- An unused block <u>that is available for use.</u>

Document: OSTA Universal Disk Format	**DCN-5106**
Subject: *Metadata Mirror File FEs and AEDs always far apart*	
Date: September 26, 2003	

Description:

Outcome of UDF Committee meeting September 15, 2003:
Not only the data for the Metadata File and its mirror must be located far apart, but also their File Entries and possible Allocation Extent Descriptors. The latter does NOT depend on the value of the Duplicate Metadata Flag.
This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Change:

In the NOTE after the second dotted list of 2.2.13.1 replace:

NOTE: In the case where the *Duplicate Metadata Flag* in the Metadata Partition Map is set, the allocations for the Metadata File and Metadata Mirror File should be as far apart (physically) as possible. Typically this is achieved by maximizing the difference between the start LBNs of the extents belonging to the file and its mirror. Likewise the file entries for these two files should be recorded as far apart as possible. Some drive/media …

by:

NOTE: The File Entry and possible Allocation Extent Descriptors of the Metadata File should be recorded as far apart (physically) as possible from those of the Metadata Mirror File. The same counts for the allocated extents of these two files in the case that the *Duplicate Metadata Flag* in the Metadata Partition Map is set. Typically, recording far apart is achieved by maximizing the difference between the start LBNs of the descriptors and extents belonging to the file and its mirror. Some drive/media …

Document: OSTA Universal Disk Format	**DCN-5107**
Subject: *Clarify overlapping of Sparing Table with a partition*	
Date: September 25, 2003; modified November 4, 2004	

Description:

This DCN is for the next UDF revision after 2.50 **and for the errata of UDF 1.50 thru 2.50**.

Sparing Area may overlap with a partition, but it is not clearly defined in UDF 1.50 thru UDF 2.50 whether instances of the Sparing Table may overlap with a partition or not.

History of this DCN:

In the UDF committee meeting, September 15, 2003 it was decided not to allow overlap of the Sparing Table with a partition and a DCN-5107 with that content and title "*Sparing Table itself shall not overlap with a partition*" was approved on December 8, 2003. However, it appeared that existing implementations were broken in this way. Therefore, it was decided in the meeting, November 4, 2004 to reopen DCN-5107 and reverse the previous decision and clearly define that overlap is allowed and how shall be acted in that case with respect to the Non-Allocated Space Stream. The DCN title was changed accordingly.

For UDF 1.50, Non-Allocated Space List must be read instead of Non-Allocatable Space Stream. For UDF 1.50 thru UDF 2.01, section 2.2.11 must be read instead of 2.2.12.

Change:

In 2.2.12, in the 3rd paragraph of page 38 replace:

Available sparing areas may be anywhere on the media, either inside or outside of a partition. If located inside a partition, sparable space shall be marked as allocated and shall be included in the Non-Allocatable Space Stream.

by:

Available sparing areas and instances of the Sparing Table may be anywhere on the media, either inside or outside of a partition. If overlapping with a partition, the overlapping part shall be marked as allocated and shall be included in the Non-Allocatable Space Stream.

Document: OSTA Universal Disk Format	**DCN-5108**
Subject: *Descriptor CRC Length Uint16 overflow rules*	
Date: October 04, 2003; modified September 14, 2004	

Description:

This DCN is for the next UDF revision after 2.50 **and for the errata of the UDF revisions 1.02 thru 2.50**.

This issue was discussed in the UDF Committee meeting September 15, 2003.

Mind that section numbers may differ for previous revisions.

Since the definition of UDF, until now nobody seems to have been aware of the fact that the value of the Descriptor CRC Length can easily overflow for some descriptors. The default value for the CRC Length is (length of descriptor – 16), so if a descriptor length grows beyond 65551 (= 16 + MAX_UINT16) bytes, the CRC length does no longer fit in the Uint16 Descriptor CRC Length Field. Candidates for this are the descriptors that have a 'no max' length in the table of UDF section 5.1. However, the Sparing Table is missing in this table, and also has a "no max" length. This omission will also be repaired in this DCN. The 'no max' candidates are:

Logical Volume Descriptor (LVD), Logical Volume Integrity Descriptor (LVID), Unallocated Space Descriptor(USD), Space Bitmap Descriptor (SBD) and Sparing Table (ST).

The descriptors that practically can grow above a length of 65551 are the SBD and ST because:

- For the LVD, 1017 Type 2 partition maps can be recorded before the LVD length grows beyond 65551 bytes. This could only occur for a multiple volume Volume Set. Such a Volume Set has the restriction of one partition map for each volume.
- For the LVID, in the case of 8000 partition maps, still 1471 bytes are left for the Implementation Use field. UDF itself only needs 46 bytes for Implementation Use.
- For the USD, there is room for 8190 extent_ad's, which should be enough for the registration of unallocated space outside the partitions.

The ECMA intent of the CRC is to detect descriptor damage. This is a valuable mechanism. For the Space Bitmap Descriptor (SBD), a CRC length of (descriptor length – 16) or 0 is allowed, because the bitmap can be updated very frequently, and it would be cumbersome to calculate the CRC over the whole descriptor for each bitmap change. For the Sparing Table (ST), only (descriptor length – 16) is allowed for the CRC length. The ST however is not updated frequently and a CRC calculation over the Map Entries is very valuable, e.g. for distinguishing between damaged an undamaged instances of the Sparing Table, in the case that a block (not the first one) of a ST instance is accidentally overwritten. Further the most important Map Entries of the ST are in the beginning,

because the Map Entries are sorted on the 'Original Location' field, moving the unused and defective Map Entries to the end of the descriptor.

Because of these considerations and in order to keep the rules as simple as possible, no extra exceptions for the CRC Length rule of the ST are introduced, but the default rule specified in 2.2.1.2 and 2.3.1.2 are adapted in order to cope with the 16 bits overflow case. An extra benefit is that also the theoretical cases (LVD, LVID and USD) are covered by this rule.

Changes:

In the table **5.1 Descriptor Lengths** add a row with:

Sparing Table	no max

In **2. Basic Restrictions & Requirements** replace:

Descriptor CRCs   CRCs shall be supported and calculated for all Descriptors except for the Space Bitmap Descriptor. There is a CRC length special case for the Allocation Extent Descriptor.

_by:_

Descriptor CRCs   CRCs shall be supported and calculated for all Descriptors. There are exception rules for the Descriptor CRC Length of the Space Bitmap Descriptor and the Allocation Extent Descriptor.

In **2. Basic Restrictions & Requirements** remove row:

Space Bitmap   Descriptor CRC not required.

*Replace the complete text of section **2.2.1.2** by:*

CRCs shall be supported and calculated for each descriptor. Unless otherwise specified, the value of the Descriptor CRC Length field shall be set to the minimum of the following two values: ((Size of the Descriptor) - (Length of Descriptor Tag)); 65535. When reading a descriptor, the Descriptor CRC should be validated.

NOTE 1: The *DescriptorCRCLength* field must not be used to determine the actual length of the descriptor or the number of bytes to be read. These lengths do not match in all cases because of possible *DescriptorCRCLength* truncation to 65535 and other *DescriptorCRCLength* exceptions as specified in this standard.

*Replace the complete text of section **2.3.1.2** by:*

The same applies as for volume structure *DescriptorCRCLength* values, see 2.2.1.2.

In 2.2.13.2 on page 43, first bullet, replace:

- The descriptor tag fields *DescriptorCRC* and *DescriptorCRCLength* for this SBD shall be set to zero.

by:

- The descriptor tag *DescriptorCRCLength* field for this SBD shall be set to zero or 8. The value of 8 is recommended.

and in 2.3.8.1 replace:

2.3.8.1 struct Tag DescriptorTag
The calculation and maintenance of the *DescriptorCRC* field of the Descriptor Tag for the *SpaceBitmap* descriptor is optional. If the CRC is not maintained then both the *DescriptorCRC* and *DescriptorCRCLength* fields shall be ZERO.

by:

2.3.8.1 struct Tag DescriptorTag
There are exception rules for the SBD *DescriptorCRCLength.* If the default value for the *DescriptorCRCLength* as defined by 2.3.1.2 is not used, then *DescriptorCRCLength* shall be either 8 or zero. The value of 8 is recommended.

Document: OSTA Universal Disk Format	**DCN-5109**
Subject: *Clarification of NOTE on page 41*	
Date: October 02, 2003	

Description:

This issue was discussed in the UDF Committee meeting of September 15, 2003.
This DCN is meant for the next UDF revision after 2.50 **and for the errata of UDF 2.50**.

The NOTE of 2.2.13 below the figure on page 41 can easily be misunderstood.

Changes:

*In **2.2.13 Metadata Partition** below the figure on page 41 replace:*

NOTE: the LBN values used in the diagram above are for illustrative purposes only and <u>are not</u> fixed. The partition references used <u>are</u> fixed as a consequence of the Metadata Partition implementation.

by:

NOTE: The LBN values used in the diagram above are for illustrative purposes only and <u>are not</u> fixed. The partition reference numbers used <u>are determined</u> by the order of the partition maps in the LVD.

<table>
<tr><td>Document: OSTA Universal Disk Format</td><td>DCN-5110</td></tr>
<tr><td>Subject: Appoint OS Identifier for UNIX - NetBSD</td><td></td></tr>
<tr><td>Date: August 16, 2004</td><td></td></tr>
</table>

Description:

Request from NetBSD community. This DCN is meant for the next UDF revision after 2.50 **and for the errata of the UDF revisions 1.02 thru 2.50**.

Change:

In 2nd table of 6.3 after:

4	7	UNIX - FreeBSD

add a row:

4	8	UNIX - NetBSD

Document: OSTA Universal Disk Format	**DCN-5111**

Subject: *Pseudo OverWrite Method*
Date: August 31 2004 (last updated December 06, 2004)

Description:
This DCN is for the next UDF revision after UDF 2.50 (UDF 2.60).
A new recording method for next generation write-once media was proposed and discussed at the UDF Committee meeting on June 2004. This DCN has been constructed to describe the proposed method.

Document Change List:

- *09/03/04 Added section 6.x "Pseudo OverWrite Method":*
- *09/13/04 Changes as per review comments*
- *10/26/04 Editorial Changes*
- *11/19/04 Changes as per 11/04/04 OSTA-UDF meeting*
- *12/01/04 Editorial changes after e-mail reviews of DCN and UDF 2.60 draft*
- *12/06/04 Final changes in OSTA-UDF meeting*

6.x Introduction to the Pseudo OverWrite Mechanism

In previous UDF revisions (as described in specifications v1.5 through v2.5), multiple sessions, or the VAT is used to achieve sequential recording functionality on CD-R, DVD-R, and DVD+R media. Next generation drives supporting *pseudo overwrite capability* on sequentially recordable media will contribute to a decrease in file system complexity. The UDF Pseudo OverWrite method described in this appendix can be applied to such pseudo overwritable sequentially recordable media.

Benefits of the UDF Pseudo OverWrite method include:

- Increased compatibility as ensured by the drive supporting pseudo overwrite functionality and defect management
- Reduced complexity in file system implementations since the entire volume space is overwritable (at logical sector granularity) while defect management is implemented in the drive
- UDF implementations can use the Metadata File to locate metadata in a logically contiguous manner. This metadata can optionally be duplicated in the Metadata Mirror File in order to achieve the desired redundancy

6.x.1 Characteristics of Media formatted for Pseudo OverWrite

Media formatted for Pseudo OverWrite will support multi-track recording. All logical sectors in the volume space on the media can be overwritten.

The file system can write concurrently to multiple tracks. A track is defined as *reserved* or *used*, see 1.3.2. Each track is sequentially recordable only. The *Next Writable Address* (or NWA) is obtained by the file system by querying the drive and points to the next recordable logical sector within the track.

In addition to sequential recording, any logical sector in a track before the NWA can be independently overwritten. Also sectors in a *used* track (having no valid NWA) can be overwritten. Overwriting is supported by the drive by recording updated data either within the Spare Area (by the linear replacement algorithm) or to some NWA within the volume space. UDF does not currently propose any policy specifiable by the file system to control physical placement of data being overwritten.

While performing sequential recording on the medium after requesting the NWA of a track, the drive system shall behave in such a way that the NWA will not change unexpectedly, or without notification, until the UDF implementation queries for the NWA of that track again. When pseudo overwrite is performed all the NWAs become invalid.

The drive is entirely responsible for maintaining the remap entry information for the logical sectors that can and may be persisted within the volume space.

6.x.2 Write Strategy

Tracks can be utilized to record different data types in a logically contiguous manner (e.g. metadata, metadata mirror and data, can be recorded in separate tracks). When all unrecorded sectors in a reserved track have been exhausted, the UDF implementation can assign a new reserved track (by *splitting* any existing reserved track) of an appropriate size.

By allowing reserved tracks to be split, the drive enables recording of the AVDP (comprising volume structure) at any two locations of: LSN 256, the last LSN in the volume, or (Last LSN – 256) as per ECMA 167.

It is desirable for UDF implementations to duplicate the metadata in the Metadata Mirror File.

Figure 1 below illustrates the track layout for a freshly formatted medium where the Metadata Mirror File is not being recorded. Track #1 contains the volume structure (including the AVDP at LSN 256) as well as related file structures. The Duplicate Metadata Flag in the Metadata Partition Map is set to zero. The format utility has allocated an extent (track) for metadata recording while Track #3 comprises the majority of recordable volume space to be utilized as required.
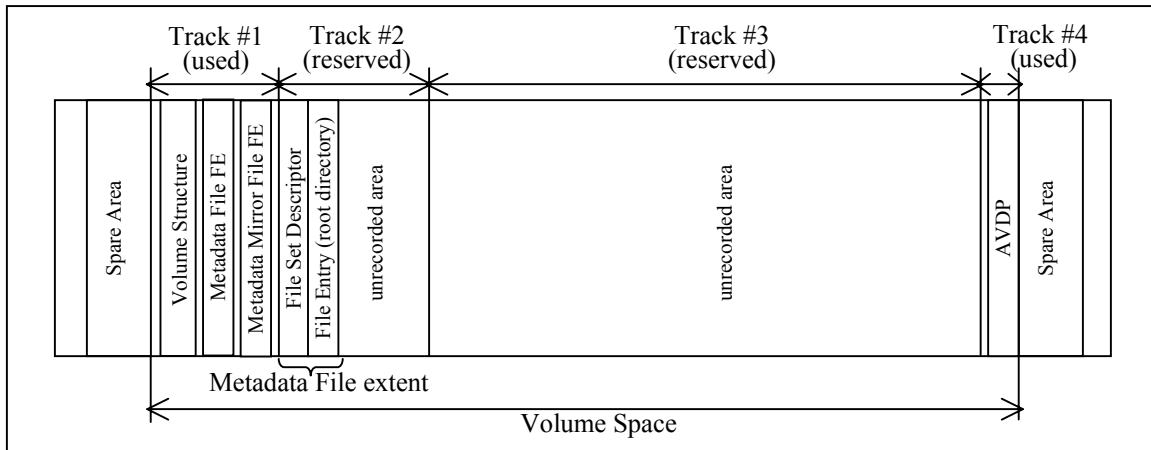

Figure 1: Freshly formatted medium – no Metadata Mirror File

Figure 2 below also illustrates the track layout for a freshly formatted medium where the Metadata Mirror File will be recorded. The Duplicate Metadata Flag in the Metadata Partition Map is set to one. Hence an extent has been allocated for the contents of the Metadata Mirror File.
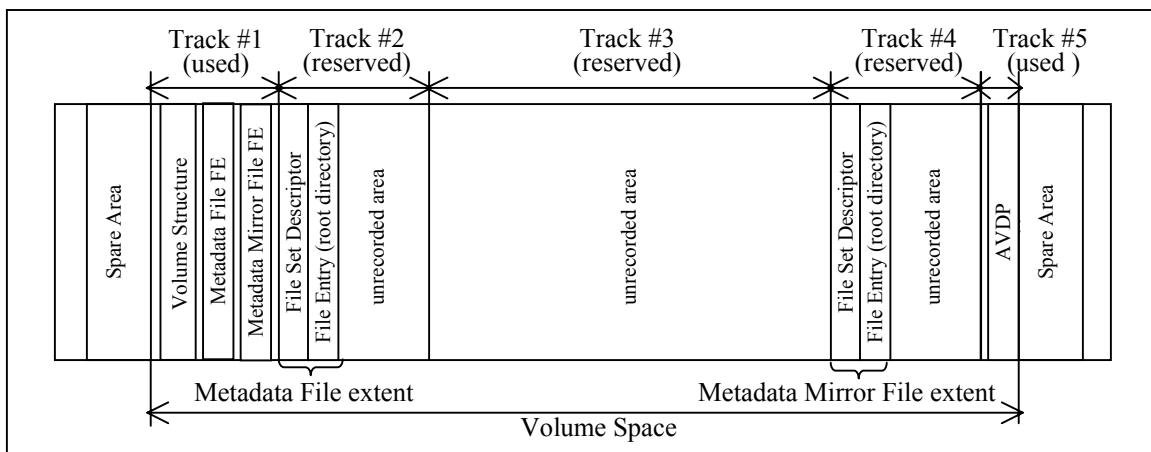

Figure 2: Freshly formatted medium – Metadata Mirror File will be recorded

Figure 3 below illustrates track layout on media after files have been recorded (note that – in this case – the Metadata Mirror File is not being recorded). In this illustration, Track #2 is in the *used* state; hence Track #4 was allocated for additional recording of metadata (Track #3 is being used to record data).
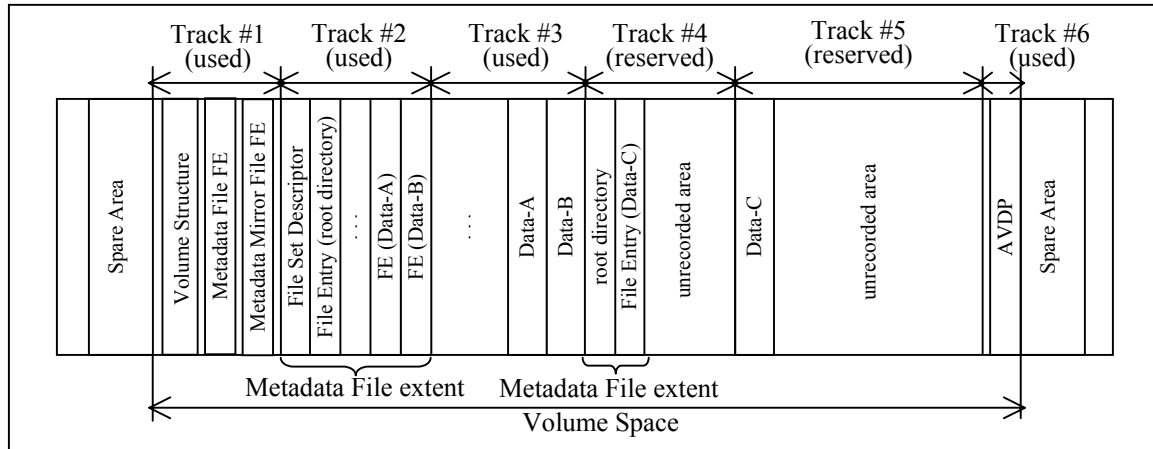

Figure 3: Recording data on medium (no Metadata Mirror File)

6.x.3 Requirements for UDF Implementations

UDF implementations are expected to conform to the following requirements:

- For sequentially recordable media formatted for Pseudo OverWrite, the Access Type in the Partition Descriptor shall be set to zero (pseudo-overwritable), see section 2.2.14.2
- The Unallocated Space Bitmap and Unallocated Space Table shall not be recorded
- The Metadata Partition Map shall be recorded
- The Metadata Bitmap File shall not be recorded
- Up to 4 tracks can be concurrently in a "reserved" state
- Multisession /Multiborder recording shall not be used with Pseudo OverWrite

6.x.4 Implementation Notes for UDF Implementations

- Query the drive to determine whether a pre-formatted medium supports Pseudo OverWrite. At format time, set the pseudo overwrite attribute on the medium (as per UDF implementation policy).
- Writing data to previously unrecorded sectors will require querying the drive to determine the NWA in a track – the returned value will be an absolute logical sector number (relative to LSN 0 in the volume space).
- Do not attempt to re-use sectors previously allocated to a file marked for deletion.
- Minimize the amount of data being overwritten.

- Prior to allocating a new reserved track (by splitting an existing reserved track) ensure that the current track reserved for such data/metadata is in the *used* state.
- The Metadata File and the Metadata Mirror File can have more than one extent in a single track. The extents of these files should not be pre-allocated as some of the sectors could be used by the drive for Pseudo OverWrite or defect management.

Document: OSTA Universal Disk Format	**DCN-5112**

Subject: BD non-POW media *recommendations for UDF 2.50*
Date: November 4, 2004; modified December 15, 2004

Description:

This DCN is for the next UDF revision after 2.50 (UDF 2.60) **and for the UDF 2.50 errata**.

The Blu-ray Disc (BD) Format for consumer appliances uses UDF 2.50 as the file system for the Blu-ray Read-Only disc (BD-ROM) and Blu-ray Rewritable disc (BD-RE). The Blu-ray Recordable disc (BD-R) using SRM without Logical OverWrite (non-POW), also uses UDF 2.50. BD-R using SRM with Logical OverWrite (POW) uses UDF 2.60, rather than UDF 2.50. POW stands for Pseudo OverWrite.

The purpose of this proposal is to provide enough information for the requirements and restrictions in the Blu-ray Disc Format, and to support good interchangeability between both computer systems and consumer appliances using Blu-ray Disc.

The text in this DCN, is meant for the UDF 2.50 errata and describes the requirements and recommendations for BD-R non-POW media, so all the BD media that use UDF 2.50.

The text in this DCN is also copied to the UDF 2.60 specification, except for the text in section 6.y.3. The text of 6.y.3 for the UDF 2.60 specification is in a separate DCN-5114.

Change:

Insert a new section 6.y to describe the recommendations for Blu-ray Disc:

6.y Recommendations for Blu-ray Disc media

This appendix defines the requirements and recommendation on volume and file structures for Blu-ray Disc (BD) media, to support data interchange among computer systems and consumer appliances. These requirements do not apply to the discs when the use of the discs is limited to computer systems and there is no necessity to provide interchangeability with consumer appliances. Specific requirements related to BDAV and BDMV application usage are described in section 6.y.4.

Blu-ray Disc has the following three types of media:
- Blu-ray Disc Read-Only Format (BD-ROM)
- Blu-ray Disc Rewritable Format (BD-RE)
- Blu-ray Disc Recordable Format (BD-R)

BD-R can use either SRM with LOW or SRM without LOW, for details see section 6.y.3. BD-ROM, BD-RE and BD-R using SRM without LOW, all use UDF revision 2.50. BD-R using SRM with LOW uses UDF revision 2.60, rather than 2.50.

Common characteristics and requirements for these three media types are:
1. Logical sector size is 2048 bytes.
2. ECC Block Size is 65536 bytes (64KB)
3. Sparable Partition Map and Sparing Table shall not be recorded.
4. Non-Allocatable Space Stream shall not be recorded.

6.y.1 Requirements for Blu-ray Disc Read-Only Format (BD-ROM)

A Blu-ray Read-Only disc (BD-ROM) is a Read-Only medium. The BD-ROM File
System Format shall comply with UDF revision 2.50 and has the following additional
requirements:

For Volume Structure:
1. The Partition Descriptor Access Type shall be 1 (read-only).
2. Three Anchor Volume Descriptor Pointers should be recorded.

For File Structure:
3. Unallocated Space Table and Unallocated Space Bitmap shall not be recorded.
4. Metadata Bitmap File shall not be recorded.

NOTE: Duplication of Metadata File data is optional. When robustness is required, it is
recommended that duplication is used and that Metadata File and Metadata Mirror File
data and descriptors are recorded at the physically inner radius area and outer radius area,
respectively.

6.y.2 Requirements for Blu-ray Disc Rewritable Format (BD-RE)

A Blu-ray Rewritable disc (BD-RE) is a non-sequential recording medium. A BD-RE drive performs read modify write operations when needed. Defect free logical space is provided by a BD-RE drive which performs defect management using the linear replacement algorithm.

The BD-RE File System Format shall comply with UDF revision 2.50 and has the following additional requirements:

For Volume Structure:
1. The Partition Descriptor Access Type shall be 4 (overwritable).

For File Structure:
2. An Unallocated Space Bitmap shall be recorded, no Unallocated Space Table.

NOTE: Duplication of Metadata File data is optional. When the user requires robustness rather than write performance, it is recommended that duplication is used and that Metadata File and Metadata Mirror File data and descriptors are recorded at the physically inner radius area and outer radius area, respectively.

Requirements for Defect Management:
Spare Area shall be assigned on a Blu-ray Rewritable disc, as the UDF file system requires Drive Defect Management by the drive system. In general, Spare Areas with the default size are assigned at format time.

NOTE: When the available clusters in Spare Area are exhausted, additional Spare Area can be allocated after all data is backed up to the other media. On the other hand, if a special utility tool can move some file data and volume structure on the disc in order to shorten the volume space, the Spare Area can be expanded preserving the file data on the disc.

6.y.3 Requirements for Blu-ray Disc Recordable Format (BD-R)
{note: this section is for UDF 2.50 errata only, for UDF 2.60 text, see DCN-5114}

A Blu-ray Recordable disc (BD-R) is a Write-Once medium that can use Sequential Recording Mode (SRM) either with or without Logical OverWrite (LOW). Drive based defect management using the linear replacement algorithm is supported.

For the BD-R File System Format for media using SRM with LOW (Pseudo OverWrite), UDF 2.60 is used. For further details, see the UDF 2.60 specification.

The BD-R File System Format for media using SRM without LOW shall comply with UDF revision 2.50 and has the following additional requirements:

For Volume Structure:
1. The Partition Descriptor Access Type shall be 1 (read-only) or 2 (write-once).

For File Structure:
2. Unallocated Space Table and Unallocated Space Bitmap shall not be recorded.
3. Only ICB Strategy Type 4 shall be used.

6.y.4 Information about AV Applications

The Blu-ray Disc Format has two types of AV Application Formats that are called
"BDAV Application" and "BDMV Application".

Information about BDAV Application Use
The "BDAV Application" is a Video Recording Format for BD-RE discs and BD-R
discs, including AV Stream and database for playback the AV Stream.
The "BDAV", "BDAV1", "BDAV2", "BDAV3", and "BDAV4" directories immediately
under the root directory are reserved for the BDAV application.

Information about BDMV Application Use
The "BDMV Application" is a Video Application Format for BD-ROM discs, including
AV Stream and database for playback the AV Stream.
The "BDMV" directory immediately under the root directory is reserved for the BDMV
application.

6.y.4.1 Requirements for BDAV and BDMV Application usage
The following additional requirements are applied for BDAV and BDMV Application
usage:
1. A volume set shall consist of only one volume.
2. Only one prevailing Partition Descriptor shall be recorded in the Volume
    Descriptor Sequence.
3. A Metadata Partition Map shall be recorded.
4. Symbolic Links shall not be used for all files and directories (the value of the File
    Type field in the ICB shall not be 12).
5. Hard Link shall not be used for all files and directories.
6. Multisession and VAT recording shall not be used.

Document: OSTA Universal Disk Format	**DCN-5113**
Subject: *Main and Reserve VDS far apart*	
Date: October 12, 2004; November 4, 2004	

Description:

Several measures have been taken to increase UDF robustness. Therefore, it is strange that there are no stricter rules for the position of the Main and Reserve Volume Descriptor Sequences. This DCN also avoids mentioning these rules in the recommendations for each new media type.

This DCN is meant for the next UDF revision after 2.50 and for the UDF 2.50 errata.

Change:

After section 2.2.3.2 add a note:

NOTE: The Main VDS extent and the Reserve VDS extent shall be recorded in different ECC blocks. The locations of these extents on the volume should be as far apart as physically possible. Typically this is achieved by maximizing the difference between the start LSNs of the extents. Care should be taken in case of special LSN address schemes, e.g. for multiple layer media.

**Optical Storage
Technology Association**

Document: OSTA Universal Disk Format	**DCN-5114**
Subject: BD-R *recommendations for UDF 2.60*	
Date: November 4, 2004; modified December 15, 2004	

Description:

This DCN is for the next UDF revision after 2.50 (UDF 2.60).
The Blu-ray Disc File System for BD-R uses UDF 2.50 for non-POW media and UDF 2.60 for POW media. The purpose of this proposal is to provide enough information for the requirements and restrictions in the Blu-ray Disc Format, and to support good interchangeability between both computer systems and consumer appliances using Blu-ray Disc.
BD-ROM and BD-RE recommendations for UDF 2.50 are described in DCN-5112.
These recommendations from DCN-5112 are also copied to the UDF 2.60 specification, except for section 6.y.3 that is overruled by the text below in this DCN-5114.

Change:

For inclusion in the UDF 2.60 document, replace section 6.y.3 of DCN-5112 by the following text:

6.y.3 Requirements for Blu-ray Disc Recordable Format (BD-R)

A Blu-ray Recordable disc (BD-R) is a Write-Once medium that can use Sequential Recording Mode (SRM) either with or without Logical OverWrite (LOW). Drive based defect management using the linear replacement algorithm is supported.
The Pseudo OverWrite (POW) Method as described in 6.x {DCN-5111} can be applied on BD-R media formatted using SRM with LOW.

The BD-R File System Format shall comply with UDF revision 2.60 for SRM with LOW (POW) and shall comply with UDF 2.50 for SRM without LOW (non-POW). The following additional requirements are applied:

For Volume Structure:
1. For SRM with LOW, the Partition Descriptor Access Type shall be 0 (pseudo-overwritable).
2. For SRM without LOW, the Partition Descriptor Access Type shall be 1 (read-only) or 2 (write-once).

For File Structure:
3. Unallocated Space Table and Unallocated Space Bitmap shall not be recorded.
4. Only ICB Strategy Type 4 shall be used.

Requirements for Defect Management:
Spare Area shall be assigned for a BD-R medium formatted for SRM with LOW (POW).
In general, Spare Areas with the default size are assigned at format time.

<table>
<tr><td>Document: OSTA Universal Disk Format</td><td>DCN-5115</td></tr>
<tr><td>Subject: Enable UDF 2.50 POW read compatibility</td><td></td></tr>
<tr><td>Date: October 14, 2004; modified: November 12 (editorial)</td><td></td></tr>
</table>

Description:

This DCN is meant for the next UDF revision after UDF 2.50 **and as a UDF 2.50 errata**. This DCN enables read compatibility for partitions with an Access Type that does not match with the media type and for partitions with an unknown Access Type value. The main reason to define this now and as a UDF 2.50 errata is to enable read-only access by a UDF 2.50 implementation for media with a UDF 2.60 File System using a Pseudo-Overwrite partition an a Minimum UDF Read Revision value of 2.50 (e.g. BD-R using POW).

Changes:

<u>*At the end of 2.2.14.2, add:*</u>

If the value of Access Type is not equal to any of the defined Access Type values or if the combination of the medium and drive is not capable of performing the write action denoted by the Access Type value, the partition shall be handled as a read-only partition (e.g. an overwritable partition on a write-once medium or in a read-only drive).

NOTE: The above rule is important in order to enable read-only access by a UDF 2.50 implementation for media with a higher UDF revision (e.g. UDF 2.60) using a Pseudo-Overwrite partition and a Minimum UDF Read Revision value of 2.50.

Document:	OSTA Universal Disk Format	**DCN-5116**
Subject:	*Consequences of Pseudo OverWrite Method*	
Date:	October 15, 2004; last modified: December 06, 2004	
	Editorial change on February 28, 2005 because DCN-5102 was changed.	

Description:

This DCN is meant for the next UDF revision after UDF 2.50 (UDF 2.60).
For UDF 2.60, parts of DCN-5101 and DCN-5102 are overruled by this DCN.
This DCN describes the changes for the UDF specification as a consequence of the Pseudo-OverWrite Method as described in DCN-5111. The special two partition case with a read-only partition and a pseudo-overwritable partition is not allowed.
February 28, 2005: Editorial change, to keep input text for this DCN consistent with changed text of DCN-5102. No consequences for the UDF 2.60 text. The reason for this change is to locate all non-POW changes in DCN-5102, so that these changes are effective for the UDF 2.50 errata.

Changes:

*Add to **1.3.4 Acronyms:***

POW -   Pseudo OverWrite as described in appendix <6.xx>(DCN-5111).
NWA -   Next Writable Address in a track

Add to 1.3.2 Definitions {note: definitions are sorted alphabetically}:

Pseudo OverWrite	Overwrite performed logically by drive on write-once media using sequential recording.
reserved track	A *reserved* track is a track that has a valid Next Writable Address (NWA). For Pseudo OverWrite, this means that sequential write at the NWA and pseudo overwrite until the NWA is possible for this track.
used track	A *used* track is a track that does not have a valid Next Writable Address. For Pseudo OverWrite, this means that sequential write to this track is not possible. Pseudo overwrite is still possible.

Replace the complete section 2.2.14.2 by: (see note below)

2.2.14.2 Uint32 AccessType

Besides the values for Access Type as defined in ECMA 3/10.5.7, UDF defines that the value zero shall be used for an Access Type named pseudo-overwritable. This Access Type value shall be used for partitions that support the Pseudo OverWrite Method as described in appendix <6.xx>.

A partition with Access Type 3 (rewritable) *shall* define a Freed Space Bitmap or a Freed Space Table, see 2.3.3. All other partitions *shall not* define a Freed Space Bitmap or a Freed Space Table.

For some rewritable/overwritable media types there may be confusion between partition access types 3 (rewritable) and 4 (overwritable).

Rewritable partitions are used on media that require some form of preprocessing before rewriting data (for example legacy MO). Such partitions shall use Access Type 3. Overwritable partitions are used on media that *do not* require preprocessing before overwriting data (for example: CD-RW, DVD-RW, DVD+RW, DVD-RAM, BD-RE, HD DVD-Rewritable). Such partitions shall use Access Type 4.

{note: the addition of DCN-5115 follows here}

*In **2. Basic Restrictions & Requirements** -> Partition descriptor,*
at the bottom of page 8 replace:

A Partition Descriptor Access Type of Read-Only, Rewritable, Overwritable and Write-Once shall be supported. …

by:

A Partition Descriptor Access Type of read-only, rewritable, overwritable, write-once and pseudo-overwritable shall be supported. …

In the first paragraph of 2.2.10 (DCN-5101) replace:

A Metadata Partition Map *shall* be recorded for volumes that contain a single Partition Descriptor having an access type of 1 (read only) or 4 (overwritable) and …

by:

A Metadata Partition Map *shall* be recorded for volumes that contain a single Partition Descriptor having an access type of 0 (pseudo-overwritable), 1 (read-only) or 4 (overwritable) and …

In 2.2.13 (text DCN-5102) replace:

When a Type 2 Metadata Partition map is recorded, the Metadata File, Metadata Mirror File and Metadata Bitmap File shall also be recorded and maintained. The sole exception is that a Metadata Bitmap File shall not be recorded for a read-only partition.

by:

When a Type 2 Metadata Partition Map is recorded, the Metadata File, Metadata Mirror File and Metadata Bitmap File shall also be recorded and maintained. The exception is that a Metadata Bitmap File shall not be recorded for a read-only partition and for a pseudo-overwritable partition.

In 2.2.13 at the bottom of page 40 (text DCN-5102) replace:

Logical blocks allocated to the Metadata or Metadata Mirror Files shall be marked as allocated in the partition unallocated space bitmap, therefore a mechanism to determine available blocks within the metadata partition is needed. This is accomplished through the Metadata Bitmap File. A Metadata Bitmap File shall not be recorded for a read-only partition.

by:

Logical blocks allocated to the Metadata or Metadata Mirror Files shall be marked as allocated in the partition unallocated space bitmap, therefore a mechanism to determine available blocks within the Metadata Partition is needed. This is accomplished through the Metadata Bitmap File.
A Metadata Bitmap File shall not be recorded for a read-only partition and for a pseudo-overwritable partition.

At the end of 2.3.3 Partition Header Descriptor
replace the note added by ==DCN-5102==,
replace:

NOTE 2: A Space Table or Space Bitmap shall not be recorded for a read-only partition
or for a file system using a VAT.
by:
NOTE 2: A Space Table or Space Bitmap shall not be recorded for a read-only partition,
a pseudo-overwritable partition or for a file system using a VAT.

In 2. Basic Restrictions & Requirements -> File Set Descriptor,
in the middle of page 9 replace:

There shall be exactly one File Set Descriptor recorded per Logical Volume on
Rewritable/Overwritable media. For WORM media multiple File Set Descriptors may be
recorded based upon certain restrictions defined in this document. The FSD extent may
be terminated by the extent length.

by:
There shall be exactly one File Set Descriptor recorded per Logical Volume. The sole
exception is for non-sequential write-once media (WORM), see 2.3.2.
The FSD extent may be terminated by the extent length.

In 2.2.6.2, replace:
Since most operating systems require that an implementation provide the true free space
of a Logical Volume at mount time it is important that these values be maintained for all
non-virtual partitions. The optional value of #FFFFFFFF, which indicates that the amount
of available free space is not known, shall not be used for non-virtual partitions. For
virtual partitions the FreeSpaceTable value shall be set to #FFFFFFFF.

by:
Since most operating systems require that an implementation provides the true free space
of a Logical Volume at mount time it is important that the Free Space Table values be
maintained for all partitions, except for the following two cases:

1) For a virtual partition and for a partition with access type pseudo-overwritable,
   the Free Space Table value shall be set to #FFFFFFFF.
2) For a partition with access type read-only, the Free Space Table value shall
   be set to zero.

In all other cases, the optional value of #FFFFFFFF, which indicates that the amount of
available free space is not known, shall not be used.

Optical Storage Technology Association

Document: OSTA Universal Disk Format	**DCN-5117**
Subject: *Common aspects of recording for different media*	
Date: October 19, 2004; modified December 21, 2004	

Description:

This DCN is meant for the next UDF revision after 2.50.

In the UDF 2.50 specification, there are separate sections that define VAT and Multisession usage, one for CD-R/RW and one for DVD+R. In order to avoid more of these sections (like for BD-R), the common recommendations for VAT and Multisession usage will be concentrated in a new section with "Common aspects of recording for different media". The medium specific aspects of VAT and Multisession usage will remain in the sections where they currently are or they will explicitly be mentioned as exceptions in the new common section.

The section for DVD-R (6.12.3) will not be touched, because it assumes UDF 2.00 usage and it is for consumer appliances only.

The new section will be integrated with the current section about Real-Time files. Real-Time files is also a common aspect of recording for different media.

On December 21, 2004, the following addition was made at the end of this DCN as an editorial change:

It appears that in the DVD+R recommendations, there is no information about the logical sector size and ECC packet length, while there is for DVD+RW, so this information is moved to the common section 13 that is valid for both for DVD+RW and DVD+R.

Change:

*In **1.3.2 Definitions,** at the bottom of page 5*
replace:

Session   The tracks of a volume shall be organized into one or more sessions as specified by the Orange Book part-II. A session shall be a sequence of one or more tracks, the track numbers of which form a contiguous ascending sequence.

by:

Session   The tracks of a volume shall be organized into one or more sessions, e.g. for CD see the Orange Book part-II. A session shall be a sequence of one or more tracks, the track numbers of which form a contiguous ascending sequence.

6.11 Common aspects of recording for different media.

In the following sections, common aspects of recording for different media are described. These aspects are:

- Real-Time files
- Incremental recording using VAT
- Multisession discs
- Bridge discs

Media that do not support sessions are assumed to have a single session that starts at logical sector zero and ends at the highest addressable logical sector number. Media that do not support tracks are assumed to have a single track per session with the same size and start address as the session. For some media different terms may be used for 'track' and 'session', e.g. for DVD+R, a track is called a Fragment.

6.11.1 Real-Time Files

A Real-Time file shall be identified by file type 249 in the File Type field of the file's ICB Tag. A Real-Time file is a file that requires a minimum data-transfer rate when writing or reading, for example, audio and video data. For these files, special read and write commands are needed. For example for CD and DVD devices these special commands can be found in the MMC command set specification.

6.11.2 Incremental recording using VAT

This type of recording is used on sequential media that have a Virtual Partition Map recorded in the Logical Volume Descriptor, see 2.2.8. VAT usage is described in 2.2.11. The VAT ICB is recorded at the highest recorded Logical Sector Number on the medium. This logical sector number may be located using the READ TRACK INFORMATION command for the relevant medium, e.g. see SCSI-3 Multi Media Commands.
ECMA 167 requires at least two Anchor Volume Descriptor Pointers (AVDP) at Logical Sector Numbers 256, N or (N - 256), where N is the highest valid Logical Sector Number on the medium, see 2.2.3. Because the VAT ICB is recorded as last, N cannot be used for an AVDP. Only if the last session is closed, there shall be an AVDP at (N - 256).
For open sessions, the file system may be in an intermediate state before closing and still be interchangeable, but not strictly in compliance with ECMA 167. In the intermediate state, only one AVDP exists. It should exist at sector 256 or, if not possible due to a track reservation, it shall exist at sector 512. An AVDP at 512 must be ignored if an AVDP at 256, N-256, or N exists. An AVDP at 512 can point to a temporary Volume Descriptor Sequence that is only used in the intermediate state.

Implementations should place file system control structures into virtual space and file data into real space. Reader implementations may cache the entire VAT. The size of the VAT should be considered by any UDF originating software.

6.11.2.1 Requirements

- An intermediate state is allowed for media on which only one AVDP is recorded; this single AVDP shall be at sector 256 or sector 512 and according to the multisession rules in 6.11.3.
- The Logical Volume Integrity Descriptor shall be recorded and the volume marked as open. Logical volume integrity can be verified by finding the VAT ICB at the last recorded Logical Sector Number. If the VAT ICB is present, the volume is clean; otherwise it is dirty.
- The Partition Header Descriptor shall specify no Unallocated Space Table, no Unallocated Space Bitmap, no Freed Space Table, and no Freed Space Bitmap. The drive is capable of reporting free space directly, eliminating the need for a separate descriptor.
- Each surface shall contain 0 or 1 read only partitions, 0 or 1 write once partitions, and 0 or 1 virtual partitions. Media using VAT should contain 1 write once partition and 1 virtual partition.

6.11.2.2 End of session data

Some read-only drives (e.g. CD-ROM, DVD-ROM) can only read closed sessions. The last complete session on the disc shall conform completely to ECMA 167 and have two AVDPs recorded. This shall be accomplished by writing data according to the End of session data table below.

End of session data

Count	Description
1	Anchor Volume Descriptor Pointer
255	Implementation specific. May contain user data, file system structures, and/or link areas.
1	VAT ICB.

The implementation specific data may contain repeated copies of the VAT and VAT ICB. Compatibility with drives that do not accurately report the location of the last sector will be enhanced. Implementations shall ensure that enough space is available to record the end of session data. Recording the end of session data brings a volume into compliance with ECMA 167.

6.11.3 Multisession Usage

The Volume Recognition Sequence and Anchor Volume Descriptor Pointer locations are specified by ECMA 167 to be at a location relative to the beginning of the disc. The beginning of a disc shall be determined from a base address S for the purposes of finding the VRS and AVDP.

'S' is the logical sector number of the first data sector in the last existent session of the volume. It is the same value used in multisession ISO 9660 recording. The first track in the last session shall be a data track.

'N' is the logical sector number of the highest addressable data sector on a volume.

There shall be no more than one writable partition or session at one time, and this session shall be the last session on the disc.

A new Main and Reserve Volume Descriptor Sequence may exist in each added session, and may be different than earlier VDSs.

If the last session on a medium does not contain a valid UDF file system, the disc is not a UDF disc. Only the UDF structures in the last session, and any UDF structures and data referenced through them, are valid.

The UDF session may contain pointers to data or metadata in other sessions, pointers to data or metadata only within the UDF session, or a combination of both.

6.11.3.1 Volume Recognition Sequence
The following descriptions are added to UDF (see also ECMA 167 Part 2) in order to handle a multisession disc.

- The volume recognition area of the UDF Bridge format (see 6.11.4) shall be the part of the volume space starting at sector $S + 16$ (assuming 2K sectors).
- The volume recognition space shall end in the session in which it begins. As a result of this definition, the volume recognition area always exists in the last session of a disc.

6.11.3.2 Anchor Volume Descriptor Pointer
The Anchor Volume Descriptor Pointers (AVDP) shall be recorded on at least 2 of the following logical sector numbers: $S + 256$, $N - 256$ and N. An AVDP at sector N or $N - 256$ shall not be recorded while a session is open. In an intermediate state, a single AVDP may exist at S + 256 or $S + 512$. An AVDP at $S + 512$ must be ignored when an AVDP exists at $S + 256$, $N - 256$ or N.

6.11.4 UDF Bridge format
The UDF Bridge format allows UDF to be added to a disc that may contain another file system. A UDF Bridge disc shall contain a UDF file system in its last session. The last session shall follow the rules described in 6.11.3. The disc may contain sessions that are based on ISO 9660, vendor unique, CD audio, or a combination of file systems.
ISO 9660 requires a Primary Volume Descriptor (ISO PVD) at sector 16 (assuming 2K sectors). If an ISO 9660 file system is desired, it may contain references to the same files as those referenced by ECMA 167 structures, or reference a different set of files, or a combination of the two.
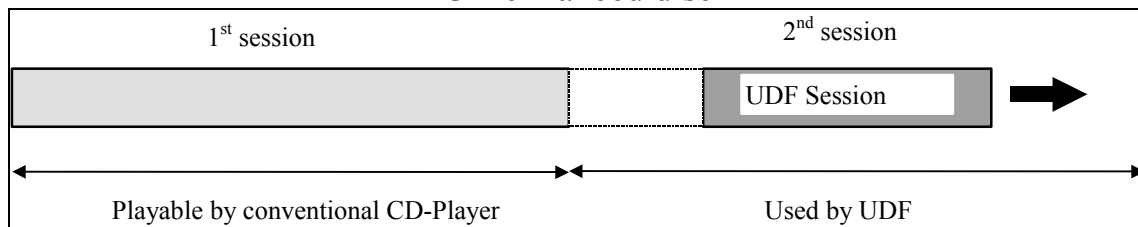
6.11.5 Examples
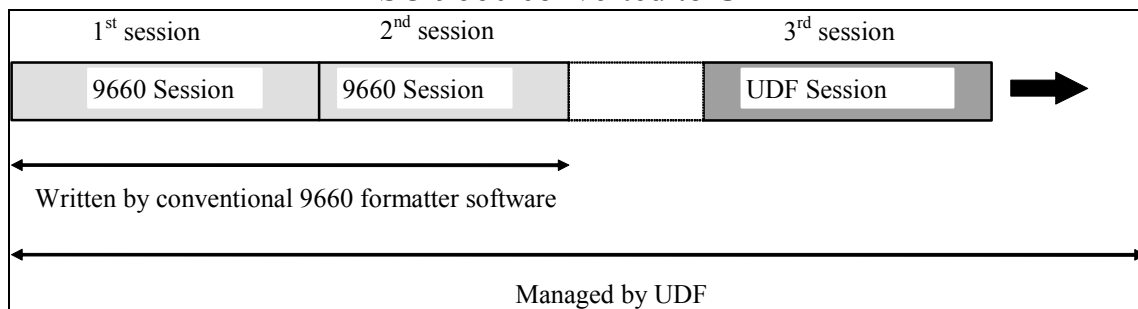Some examples of UDF Multisession discs and UDF Bridge discs are shown below.
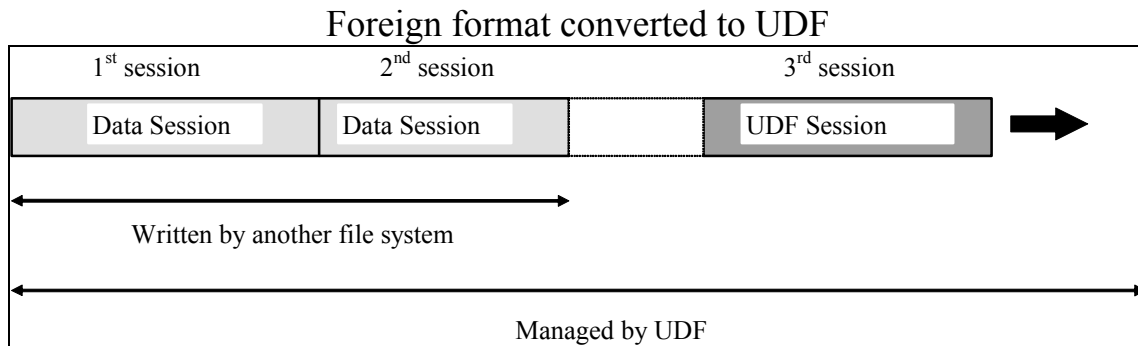
Multisession UDF disc
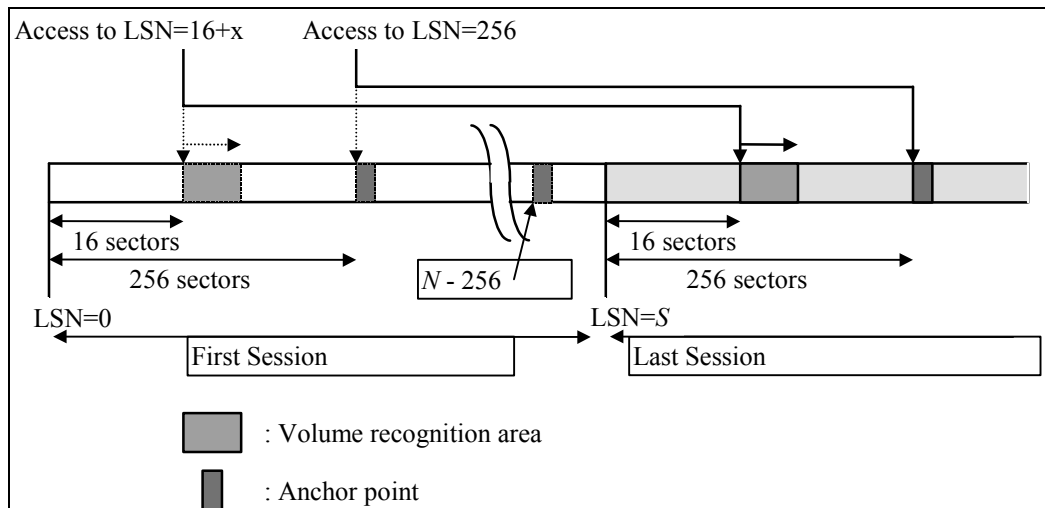
CD enhanced disc

ISO 9660 converted to UDF

Foreign format converted to UDF

For DVD+R, replace all sections 6.13.1 till 6.13.1.4.3
by:

6.13.1 Use of DVD+R media
For DVD+R, the rules of section 6.11 apply.

For CD-R, replace all sections 6.10.1 till 6.10.1.3
by:

6.10.1 Use of UDF on CD-R media
For CD-R, the rules of section 6.11 apply with the following additions:

The VAT may be located by using READ TRACK INFORMATION (for unfinished media) or READ TOC or READ CD RECORDED CAPACITY for finished media. See X3T10-1048D (SCSI-3 Multi Media Commands).

6.10.1.1 Mode requirements for CD-R
- Writing shall use Mode 1 or Mode 2 Form 1 sectors. On one disc, either Mode 1 or Mode 2 Form 1 shall be used; a mixture of Mode 1 and Mode 2 Form 1 sectors on one disc is not allowed.
  NOTE: According to the Multisession CD Specification, all data sessions on a disc must be of the same type (Mode 1, or Mode 2 Form 1).

- If Mode 2 Form 1 is used, then the subheader bytes of all sectors used by the user data files and by the UDF structures shall have the following value:

File number = 0
Channel number = 0
Submode = 08h
Coding information = 0

6.10.1.2 UDF Bridge format for CD-R
If an ISO 9660 bridge disc contains Mode 2 Form 1 sectors, then the CD-ROM XA extensions for ISO 9660 must be used. Further the rules of section 6.11.4 apply.

For CD-R and CD-RW, replace all sections 6.10.3 till 6.10.3.3
by:

6.10.3 Multisession and Mixed Mode
For CD-R and CD-RW, the multisession and bridge disc rules of 6.11 apply with the following additions:
If random write mode is used, the media may be formatted with zero or one audio sessions followed by exactly one writable data session containing one track. Other session configurations are possible but not described here.
When recorded in Random Access mode, a duplicate Volume Recognition Sequence should be recorded beginning at sector N - 16.
CD multisession discs may also contain audio sessions. The UDF Bridge format allows CD enhanced discs to be created, see an example in 6.11.5.

Added to this DCN on December 21, 2004 as an editorial change, basically moving logical sector size and ECC block size information from 6.13.2 to 6.13:

In 6.13. Recommendations for DVD+R and DVD+RW Media
replace:
DVD+R and DVD+RW Media require special consideration due to their nature. The following guidelines are established to ensure interchange.

by:
DVD+R and DVD+RW Media require special consideration due to their nature. The following information and guidelines are established to ensure interchange.

- Logical Sector Size is 2048 Bytes
- 2048 Bytes user data transfer for read and write
- ECC block size is 32768 bytes (32KB) and the first sector number of an ECC block shall be an integral multiple of 16.

In 6.13.2 Use of UDF on DVD+RW 4.7 GBytes Basic Format media
remove the two bullets:
- A Physical Sector Size of 2048 Bytes
- 2048 Byte user data transfer

and in 6.13.2.1 Requirements

replace:

- The packet length shall be 16 sectors (32 KB).
- Defective packets known at format time shall be allocated by the Non-Allocatable Space Stream (see 3.3.7.2).
- Sparing shall be managed by the host via the sparable partition and a sparing table.

by:
- Sparing shall be managed by the host via the Sparable Partition and a Sparing Table.
- The sparing Packet Length shall be 16 sectors (32 KB, one ECC block).
- Defective packets known at format time shall be allocated by the Non-Allocatable Space Stream, see 3.3.7.2.

Document: OSTA Universal Disk Format	**DCN-5118**
Subject: *Clarify location of Partition Header Descriptor*	
Date: October 25, 2004	

Description:

This DCN is meant for the next UDF revision after 2.50.
It is very difficult in the ECMA and UDF spec to find the location of the Partition Header Descriptor, so clarify.

Change:

In 2.3.3 directly after the PartitionHeaderDescriptor structure replace:

As a point of clarification the logical blocks …

by:

The Partition Header Descriptor is recorded in the Partition Contents Use field of the Partition Descriptor.
As a point of clarification the logical blocks …

In 2.2.14 Partition Descriptor

replace:	byte	PartitionContentsUse[128];
by:	byte	**PartitionContentsUse[128];**

After 2.2.14.5 add section 2.2.14.6:

2.2.14.6 byte PartitionContentsUse[128]
The Partition Contents Use field contains the Partition Header Descriptor as defined in 2.3.3.

Document: OSTA Universal Disk Format	**DCN-5119**
Subject: *Zero Information Length for Non-Allocatable Space Stream*	
Date: October 26, 2004; last update February 28, 2005	

Description:

This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.
There is no requirement for the Non-Allocatable Space Stream to have an Information
Length value of zero as for the Non-Allocatable Space List in UDF 1.50 and lower.
It is absurd to assume that there is any relevant data in this stream.

Change:

In 3.3.7.2 at the top of page 90 replace:

… The allocation descriptors shall have allocation type 1 (allocated but not recorded). …

by:

… The allocation descriptors shall have allocation type 1 (allocated but not recorded).
The Information Length in the File Entry of this stream shall be zero; so all allocation
descriptors are in the file tail. …

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Document: OSTA Universal Disk Format	**DCN-5120**
Subject: *Minimum UDF Read Revision for UDF 2.60 media*	
Date: November 5, 2004; December 6, 2004; see minutes Dec 6;	

Description:

This DCN is for the next UDF revision after UDF 2.50 (UDF 2.60).
As decided in the UDF committee meetings of November and December 2004, the Minimum UDF Read Revision for all UDF 2.60 media shall be at most #250. This is an indication to a UDF 2.50 implementation that it can read all UDF 2.60 media.
December 6, 2004 minutes:
> "It's suggested that using 0260 instead of 0150 for the revision number used in example is preferable".

However, this would not show what the function of this field is, so #0250 is chosen instead;

Change:

At the end of 2. Basic Restrictions & Requirements (page 10)
add two items:

Minimum UDF Read Revision	The Minimum UDF Read Revision value shall be at most #0250 for all media with a UDF 2.60 file system. This indicates that a UDF 2.50 implementation can read all UDF 2.60 media. Media that do not have a Metadata Partition may use a value lower than #250.

In 2.2.6.4. replace:

> *Minimum UDF Read Revision* - Shall indicate …
>
> …
> … This number shall be stored in binary coded decimal format, for example #0150 would indicate revision 1.50 of the UDF specification.

by:

> *Minimum UDF Read Revision* - Shall indicate …
>
> …
> … This number shall be stored in binary coded decimal format, for example #0250 would indicate revision 2.50 of the UDF specification.

See further requirements in the Basic Restrictions & Requirements section.

Document: OSTA Universal Disk Format   **DCN-5121**
Subject: *Clarification of Directory bit in parent FID*
Date: December 03, 2004; Modified December 06, 2004

Description:

This DCN is meant for the next UDF revision after 2.50 **and for the errata of UDF revisions 2.00, 2.01 and 2.50**.
In ECMA 4/14.4.3, below the caption of figure 13 it is stated that:
> "If the Parent bit is set to ONE, then the Directory bit shall be set to ONE."

This was true for ECMA 2nd edition, were there were no streams. However for ECMA 3rd edition a parent FID in a stream directory can point to a file or directory to which the stream directory is attached or to itself in the case of the System Stream Directory. In the case that a stream directory is attached to a file, the directory bit in the parent FID of the stream directory shall not be set. This is current practice but not described in the UDF spec.

Change:

*At the begin of current section **2.3.4.2 Uint8 FileCharacteristics** insert:*

2.3.4.2.1 Deleted bit

*At the end of current section **2.3.4.2 Uint8 FileCharacteristics** add:*

2.3.4.2.2 Parent bit and Directory bit
There is a flaw in the following statement in ECMA 4/14.4.3, below figure 13:
> "If the Parent bit is set to ONE, then the Directory bit shall be set to ONE."

In spite of this statement, the Directory bit in a parent FID shall only be set to ONE if the FID identifies a directory or the System Stream Directory. If the parent FID identifies a file, the Directory bit shall be set to ZERO. The latter is the case for a parent FID in a Stream Directory that is attached to a file.

<table>
<tr><td>Document: OSTA Universal Disk Format</td><td>DCN-5122</td></tr>
<tr><td>Subject: Make UDF2.50 identical to UDF 2.60 for non-POW</td><td></td></tr>
<tr><td>Date: November 12, 2004; modified February 22, 2005;</td><td></td></tr>
</table>

Description:

This DCN has consequences for the **UDF 2.50 errata only**, so no change for UDF 2.60. It only proposes a few small modifications in existing DCNs. These modifications only have an effect for the UDF 2.50 errata.

The goal is that UDF 2.50 together with the UDF 2.50 errata becomes 'guaranteed identical' to UDF 2.60 for the non-Pseudo OverWrite (non-POW) case.
This can be achieved by a small modification in DCN-5102 and addition of DCN-5119 to the UDF 2.50 errata. These modifications are explained here. After these modifications are executed, this DCN-5122 can effectively disappear, but it is maintained in the set of DCNs and UDF 2.50 errata as clarification.
None of these modifications have real implementation consequences for an existing UDF implementation.

A Major benefit from this is that an implementer can use a single specification document to implement both UDF 2.50 and 2.60, namely the UDF 2.60 spec, instead of going through the 2.50 spec and all errata DCNs for implementing UDF 2.50. So UDF 2.50 and 2.60 can be implemented in one action.
The only thing that a UDF 2.50 implementer needs to know is that Pseudo OverWrite and pseudo-overwritable partitions are not allowed in UDF 2.50 and that the UDF Revision field in Domain Entity Identifiers and UDF Entity Identifiers must have a value #0250 instead of #0260 (see 2.1.5.3). This will be explained in the heading of the UDF 2.50 errata document, so a UDF 2.50 implementer can decide for himself whether to use the UDF 2.50 + errata or the UDF 2.60 document.

What is needed to make (UDF 2.50 + errata) 'guaranteed identical' to (UDF 2.60 for non-POW media)?

If we would add all DCNs to the UDF 2.50 errata, we would have proved that 2.50 plus 2.50 errata is identical to 2.60.
DCNs that cannot be added to the 2.50 errata are the POW related ones, so 5111, 5114 and 5116. There is only one non-POW related issue that is in DCN-5116. It is dealt with below. Further, DCN-5120 is valid for UDF 2.60 only, so it does not make sense as UDF 2.50 errata.

Of the remaining DCNs, only 5100, 5117, 5118 and 5119 are not yet part of the UDF 2.50 errata.

5100: editorial DCN
5117: Common aspects of recording for different media   (2.01-2.60 in fact, editorial)
5118: Clarify location of Partition Header Descriptor   (1.02-2.60 in fact)
5119: Zero Information Length for Non-Allocatable Space Stream   (2.00-2.60 in fact)

The DCNs 5100, 5117 and 5118 are editorial or clarification only and it does not make sense to add them to the UDF 2.50 errata document.

So the only DCN that has to be added to the UDF 2.50 errata is DCN-5119.

Changes: {in DCNs only}

In DCN-5119

 replace: This DCN is meant for the next UDF revision after 2.50.
     by: This DCN is meant for the next UDF revision after 2.50 **and for the UDF 2.50 errata**.

Remains the non-POW related issue in DCN-5116 that affects non-POW media.
It is the bitmap not required (2.50) versus bitmap shall not be recorded (UDF 2.60) case for read-only partitions. This also has no implementation consequences and can be added to the UDF 2.50 errata by three small changes to DCN-5102:

in DCN-5102 replace: … no Metadata Bitmap File is required for a read-only partition
              by: … a Metadata Bitmap File shall not be recorded for a read-only partition

in DCN-5102 replace: A Metadata Bitmap File is not required for a read-only partition.
              by: A Metadata Bitmap File shall not be recorded for a read-only partition.

add to DCN-5102:

At the end of 2.3.3 Partition Header Descriptor
add a note:

NOTE 2: A Space Table or Space Bitmap shall not be recorded for a read-only partition or for a file system using a VAT.