IEEE P1281

SYSTEM USE SHARING PROTOCOL

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Standard for Information Technology --
Use of ISO 9660:1988 System Use Fields.

IEEE CD-ROM FILE SYSTEM FORMAT WORKING GROUP
cdfsf@ymi.com

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1. PREFACE

1.1 Purpose and Scope

The ISO 9660 CD-ROM specification (see section 5 for complete bibliographical information on referenced standards) provides System Use fields within the Directory Records to support convenient extendibility of the specification. Unfortunately, no mechanism for coordinating shared use of these areas was provided. This has led to very restricted and non-standardized uses of these areas. It is desirable to develop the following mechanism for shared utilization of the System Use fields provided by ISO 9660.

1.2 Summary of Sections

- Section 1 Contains the Preface.
- Section 2 Contains an overview of the System Use Sharing Protocol.
- Section 3 Contains an overview of the notation used in this document.
- Section 4 Contains the System Use Sharing Protocol proposal.
- Section 5 Contains the System Use Entries provided by the SUSP.
- Section 6 Contains implementation requirements.
- Section 7 Contains the Bibliography.

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2. OVERVIEW

The System Use Sharing Protocol (SUSP) specifies an extension to the ISO 9660 format for CD-ROM which enables the shared utilization of the System Use fields provided by ISO 9660 for recording system-specific extensions to ISO 9660 defined by multiple independent parties.

The SUSP specifies the definition of a generic field format and a set of generally applicable System Use Entries for recording:

- Continuation Areas
- Padding Areas
- Identifier that the System Use Sharing Protocol is used
- System Use Sharing Protocol Terminator
- Identifier of system-specific extensions that are used in a Directory Hierarchy
- Identifier of group of entries recorded in a Directory Record

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3. TERMINOLOGY AND NOTATION

It is assumed that the IEEE P1281 System Use Sharing Protocol is being utilized within an ISO 9660 compliant volume. Unless defined herein, or otherwise specified, terms shall be as defined in ISO 9660.

The following notation is used in this document:

3.1 References

References to a specific clause (for example, clause 1.2.3) of the ISO 9660 standard shall be of the form ISO 9660:1.2.3.

Note: References to "IEEE P1281" will, on adoption as an IEEE standard, become "IEEE 1281".

3.2 Decimal and Hexadecimal Notation

Numbers in decimal notation are represented by decimal digits, namely 0 to 9.

Numbers in hexadecimal notation are represented by hexadecimal digits, namely 0 to 9 and A to F, shown in parentheses. For example, the hexadecimal number 7F will be written as (7F).

3.3 System Use Fields

ISO 9660:9.1.13 provides System Use fields within Directory Records. While a similar mechanism could be used in many other ways within the ISO 9660 structure, this System Use Sharing Protocol addresses only the System Use fields within the Directory Records.

The term "System Use Area" as used in this document shall refer to the System Use field of an ISO 9660 Directory Record as well as any associated Continuation Areas designated through the use of "CE" System Use Entries (described in section 5.1 of this document).

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4. SYSTEM USE SHARING PROTOCOL

The System Use Sharing Protocol divides any System Use Area into a number of variable length fields called System Use Entries (see section 4.1). There may be zero or more System Use Entries in each System Use Area. Each System Use Entry is identified by a System Use Entry Signature Word.

No SUSP-compliant extension specification shall define a System Use Entry using the same Signature Word as any entry defined in this document.

More than one System Use Entry with the same Signature Word for a single Directory Record is allowed, unless otherwise specified in the definition of a specific System Use Entry. If allowed, the significance of the order, if any, of the recording of multiple System Use Entries with the same Signature Word and with the same or different versions shall be specified in the definition of the particular System Use Entry involved. In all other situations, the order in which the System Use Entries appear is not significant.

Unless otherwise specified in the definition of a specific System Use Entry, each System Use Entry recorded in the System Use Area of the last extent of a multi-extent file shall apply to all extents of the file and shall override any System Use Entry with the same Signature Word recorded for any other extent of the file. Thus, unless an alternate mechanism is provided in the definition of a specific System Use Entry, failure to record a valid instance of the System Use Entry for the final extent of a multi-extent file shall be treated the same as if this field had not been recorded for any extent of the file.

With the exception of the "SP" System Use Entry, which is recorded as specified in section 5.3, the first System Use Entry recorded in a System Use Area of any Directory Record shall begin in byte LEN_SKP+1 of the System Use field (see section 5.3 [5]). The first System Use Entry recorded in any Continuation Area of a System Use Area shall begin in the first byte of the Continuation Area. If multiple System Use Entries are to be recorded in the same System Use field or Continuation Area, they shall be recorded contiguously.

If the remaining allocated space following the last recorded System Use Entry in a System Use field or Continuation Area is less than four bytes long, it cannot contain a System Use Entry and shall be ignored. Otherwise an "ST" System Use Entry (see section 5.4) shall be the last System Use Entry recorded in a System Use field or Continuation Area.

4.1 System Use Entry Format

The System Use Entry format is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall specify an identification of a System Use Entry. This field shall contain two bytes. Each byte is recorded according to ISO 9660:7.1.1.

[2] "BP 3 - Length (LEN_SUE)" shall specify as an 8-bit number the length in bytes of the System Use Entry, including the Signature Word, Length, Version and Data. This field shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the System Use Entry. This field shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 to LEN_SUE - Data" shall contain the content of the System Use Entry. The format of this field depends on the Signature Word and Version of the System Use Entry. The Data field is optional.

FIGURE 1. System Use Entry Description

SIG1	SIG2	LEN_SUE	VERSION	DATA
(BP1)	(BP2)	(BP3)	(BP4)	(BP5 to LEN_SUE)

5. SYSTEM USE ENTRIES PROVIDED BY THIS SPECIFICATION

The System Use Sharing Protocol defines the following fundamental System Use Entries:

"CE" Continuation Area

"PD" Padding Field

"SP" System Use Sharing Protocol Indicator

"ST" System Use Sharing Protocol Terminator

"ER" Extensions Reference

"ES" Extension Selector

5.1 Description of the "CE" System Use Entry

The purpose of the "CE" System Use Entry is to extend the System Use field to store additional System Use Entries. The "CE" System Use Entry is optional. Multiple "CE" System Use Entries may be recorded in a System Use Area; however, at most one "CE" System Use Entry may be recorded in a single System Use field or Continuation Area.

The recording in any Continuation Area shall follow the format of the System Use Entry as described in section 4.1 of this document. A Continuation Area identified by a "CE" System Use Entry shall reside on the same Volume as that "CE" System Use Entry. If additional space is needed, the Continuation Area identified by a "CE" System Use Entry may contain another "CE" System Use Entry designating another Continuation Area. The "CE" System Use Entry indicates a Continuation Area that shall be processed after the current System Use field or Continuation Area is processed.

The format of the "CE" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall indicate that the System Use Entry is a "CE" type System Use Entry. The bytes in this field shall be (43)(45) ("CE").

[2] "BP 3 - Length" shall specify as an 8-bit number the length in bytes of the "CE" System Use Entry. The number in this field shall be 28 for this version. This field shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "CE" System Use Entry. The number in this field shall be 1 for this version. This field shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 to BP 12 - Block Location of Continuation Area" shall specify as a 32-bit number the Logical Block Number from which the start of this Continuation Area is measured. This field shall be recorded according to ISO 9660:7.3.3.

[5] "BP 13 to BP 20 - Offset to Start of Continuation Area" shall specify as a 32-bit number the offset, in bytes, from the start of the block specified in [4] above to the start of the area that is to be used for this Continuation Area. This field shall be recorded according to ISO 9660:7.3.3.

[6] "BP 21 to BP 28 - Length of the Continuation Area" shall specify as a 32-bit number the number of bytes that are to be used for this Continuation Area. This field shall be recorded according to ISO 9660:7.3.3.

FIGURE 2. "CE" System Use Entry

"C"	"E"	28	1	BLOCK LOCATION	OFFSET	LENGTH of CON-TINUATION AREA
(BP1)	(BP2)	(BP3)	(BP4)	(BP5 to BP12)	(BP13 to BP20)	(BP21 to BP28)

5.2 Description of the "PD" System Use Entry

The "PD" System Use Entry is optional.

The format of the "PD" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall indicate that the System Use Entry is a "PD" type System Use Entry. The bytes in this field shall be (50)(44) ("PD").

[2] "BP 3 - Length (LEN_PD)" shall specify as an 8-bit number the length in bytes of the "PD" System Use Entry. This field shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "PD" System Use Entry. The number in this field shall be 1 for this version. This field shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 to LEN_PD - Padding Area" shall be ignored in interchange. The contents are not restricted by this specification.

FIGURE 3. "PD" System Use Entry

"P"	"D"	LEN_PD	1	PADDING AREA
(BP1)	(BP2)	(BP3)	(BP4)	(BP5 to LEN_PD)

5.3 Description of the "SP" System Use Entry

The purpose of the "SP" System Use Entry is to provide an identifier that the System Use Sharing Protocol is being used within the given volume. Additionally, the "SP" System Use Entry specifies the number of bytes skipped within the System Use field of each Directory Record (except the "." entry of the root directory) before the recording of System Use Entries.

The "SP" System Use Entry is mandatory. The "SP" System Use Entry shall be recorded starting in byte position one (BP 1) in the System Use field of the first Directory Record of the root directory of each Directory Hierarchy (see ISO 9660:6.8.2) in which the System Use Sharing Protocol is utilized, unless the disc is a CD-ROM XA disc, in which case the "SP" System Use Entry shall be recorded starting in byte position 15 (BP 15). Only one "SP" System Use Entry shall be recorded within a single Directory Hierarchy.

The format of the "SP" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature" shall indicate that the System Use Entry is a "SP" type System Use Entry. The bytes in this field shall be (53)(50) ("SP").

[2] "BP 3 - Length" shall specify as an 8-bit number the length in bytes of the "SP" System Use Entry. The number in this field shall be 7 for this version. It shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "SP" System Use Entry. The number in this field shall be 1 for this version. This field shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 to BP 6 - Check Bytes" shall contain two check bytes. The bytes in this field shall be (BE)(EF).

[5] "BP 7 - Bytes Skipped (LEN_SKP)" shall specify as an 8-bit number the number of bytes to be skipped within the System Use field of each Directory Record (except the "." entry of the root directory) before the recording of System Use Entries other than the "SP" System Use Entries. The number in this field shall be recorded according to ISO 9660:7.1.1.

FIGURE 4. "SP" System Use Entry

"S" (BP1)	"P" (BP2)	7 (BP3)	1 (BP4)	(BE) (BP5)	(EF) (BP6)	LEN_SKP (BP7)

Note: To allow compatibility with other uses of the System Use field, the contents of BP 1 to LEN_SKP of the System Use field of each Directory Record are not restricted by this specification.

5.4 Description of the "ST" System Use Entry

The purpose of the "ST" System Use Entry is to provide a terminator for the use of the System Use Sharing Protocol for a particular System Use field or Continuation Area. The "ST" System Use Entry indicates the completion of recording of SUSP information within the current System Use field or Continuation Area. Multiple "ST" System Use Entries may be recorded in a System Use Area; however, at most one "ST" System Use Entry may be recorded in a single System Use field or Continuation Area.

An "ST" System Use Entry shall be the last System Use Entry recorded in a System Use field or Continuation Area unless the remaining allocated space in the System Use field or Continuation Area is less than four bytes long (see section 4).

The format of the "ST" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature" shall indicate that the System Use Entry is a "ST" type System Use Entry. The bytes in this field shall be (53)(54) ("ST").

[2] "BP 3 - Length" shall specify as an 8-bit number the length in bytes of the "ST" System Use Entry. The number in this field shall be 4 for this version. It shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "ST" System Use Entry. The number in this field shall be 1 for this version. This field shall be recorded according to ISO 9660:7.1.1.

FIGURE 5. "ST" System Use Entry

"S" (BP1)	"T" (BP2)	4 (BP3)	1 (BP4)

5.5 Description of the "ER" System Use Entry

The purpose of the "ER" System Use Entry is to store information which uniquely identifies a specification of system-specific extensions utilized on a specific Directory Hierarchy.

Recording of this System Use Entry is mandatory for each SUSP-compliant extension specification used in a Directory Hierarchy.

This System Use Entry shall appear in the System Use Area of the first ("." or (00)) Directory Record of the root directory of the Directory Hierarchy in which the extension specification to which this "ER" System Use Entry refers is used.

Note that the instance of the root Directory Record that appears in the Primary Volume Descriptor cannot contain a System Use field, thus the root Directory Record as recorded in the "." entry of the root directory must be used to record and retrieve this information.

The format of the "ER" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall indicate that the System Use Entry is a "ER" type System Use Entry. The bytes in this field shall be (45)(52) ("ER").

[2] "BP 3 - Length (LEN_ER)" shall specify as an 8-bit number the length in bytes of the "ER" System Use Entry. The number in this field shall be 8 + LEN_ID + LEN_DES + LEN_SRC for this version. This field shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "ER" System Use Entry. The number in this field shall be 1 for this version. This field shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 - Identifier Length (LEN_ID)" shall specify as an 8-bit number the length in bytes of the Extension Identifier recorded in this "ER" System Use Entry. This field shall be recorded according to ISO 9660:7.1.1.

[5] "BP 6 - Descriptor Length (LEN_DES)" shall specify as an 8-bit number the length in bytes of the Extension Descriptor recorded in this "ER" System Use Entry. This field shall be recorded according to ISO 9660:7.1.1.

[6] "BP 7 - Source Length (LEN_SRC)" shall specify as an 8-bit number the length in bytes of the Extension Specification Source recorded in this "ER" System Use Entry. This field shall be recorded according to ISO 9660:7.1.1.

[7] "BP 8 - Extension Version (EXT_VER)" Shall specify as an 8-bit number an identification of the version of the system-specific extensions to which this "ER" System Use Entry refers. The number in this field shall be specified by the

organization which defined the extensions to which this "ER" System Use Entry refers. This field shall be recorded according to ISO 9660:7.1.1.

[8] "BP 9 to 8 + LEN_ID - Extension Identifier (EXT_ID)" shall contain the content of the Extension Identifier. The recording of this identifier shall use d-characters or d1-characters as defined by ISO 9660:7.4. This field is mandatory. The exact content of this field is specified by the organization which defined the extensions to which this "ER" System Use Entry refers.

[9] "BP 9 + LEN_ID to 8 + LEN_ID + LEN_DES - Extension Descriptor (EXT_DES)" shall contain the content of the Extension Descriptor. The recording of this descriptor shall use a- characters or a1-characters as defined by ISO 9660:7.4. This field is optional. The minimal content of this field may be specified or recommended by the organization which defined the extensions to which this "ER" System Use Entry refers. Recording of any additional information shall follow the recording of such specified information.

[10] "BP 9 + LEN_ID + LEN_DES to 8 + LEN_ID + LEN_DES + LEN_SRC - Extension Source (EXT_SRC)" shall contain the content of the Extension Source. The recording of this Source shall use a-characters or a1-characters as defined by ISO 9660:7.4. This field is mandatory. The minimal content of this field may be specified or recommended by the organization which defined the extensions to which this "ER" System Use Entry refers. Recording of any additional information shall follow the recording of such specified information.

FIGURE 6. "ER" System Use Entry

"E"	"R"	LEN_ER	1	LEN_ID	LEN_DES	LEN_SRC
(BP1)	(BP2)	(BP3)	(BP4)	(BP5)	(BP6)	(BP7)

EXT_VER	EXT_ID	EXT_DES
(BP8)	(BP9 to 8 + LEN_ID)	(BP9 + LEN_ID to 8 + LEN_ID + LEN_DES)

EXT_SRC
(BP9+LEN_ID+LEN_DES to 8+LEN_ID+LEN_DES+LEN_SRC)

5.6 Description of the "ES" System Use Entry

The purpose of the "ES" System Use Entry is to allow implementations to easily resolve conflicts between signature word definitions when multiple SUSP extension specifications are used within a single Directory Hierarchy. This System Use Entry shall be mandatory in cases where more than one extension specification is being used within a single Directory Hierarchy.

When multiple SUSP extension specifications are used on a single Directory Hierarchy, multiple "ER" System Use Entries for those extension specifications are recorded in the first ("." or (00)) Directory Record of the root directory of the Directory Hierarchy. The order in which those "ER" System Use Entries are recorded shall determine the Extension Sequence Numbers of the different extension specifications used.

If "ES" System Use Entries are used, the recording of one or more System Use Entries defined by an SUSP extension specification shall be immediately preceded by an "ES" System Use Entry containing the appropriate Extension Sequence Number. Multiple "ES" System Use Entries with the same Extension Sequence Number may be recorded in the System Use Area of a single Directory Record.

Note: Some SUSP-style, non-SUSP-compliant specifications do not have a defined "ER" Entry. Recording of such non-compliant specification entries is implementation-specific.

The format of the "ES" System Use Entry is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall indicate that the System Use Entry is an "ES" type System Use Entry. The bytes in this field shall be (45)(53) ("ES").

[2] "BP 3 - Length (LEN_ES)" shall specify as an 8-bit number the length in bytes of the "ES" System Use Entry. The number in this field shall be 5 for this version. It shall be recorded according to ISO 9660:7.1.1.

[3] "BP 4 - System Use Entry Version" shall specify as an 8-bit number an identification of the version of the "ES" System Use Entry. The number in this field shall be 1 for this version. It shall be recorded according to ISO 9660:7.1.1.

[4] "BP 5 - Extension Sequence" shall specify as an 8-bit number the Extension Sequence Number of the extension specification utilized in the entries immediately following this System Use Entry. The Extension Sequence Numbers of multiple extension specifications on a volume shall correspond to the order in which their "ER" System Use Entries are recorded in the first Directory Record of the root directory of the Directory Hierarchy in which the extensions are used. It shall be recorded according to ISO 9660:7.1.1.

FIGURE 7. "ES" System Use Entry

"E" (BP1)	"S" (BP2)	5 (BP3)	1 (BP4)	EXTENSION SEQUENCE (BP5)

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6. REQUIREMENTS FOR SYSTEMS

The System Use Sharing Protocol specifies that certain information shall be communicated between a user and an implementation.

An information processing system that conforms to this protocol shall be the subject of a description which identifies the means by which the user may supply such information, or may obtain it when it is made available, as specified in this standard.

6.1 Requirements for an Originating System

All originating systems which claim to implement the System Use Sharing Protocol must comply with the protocol throughout each recorded System Use Area.

The implementation shall be capable of recording the set of System Use Entries that is specified in this standard, on a Volume Set in accordance with one of the interchange levels specified in ISO 9660.

The implementation shall allow the data preparer to supply the information that is to be recorded in the System Use Area according to the System Use Sharing Protocol and shall supply the information for any required fields if the data preparer does not supply it.

6.2 Requirements for a Receiving System

All receiving systems which claim to implement the System Use Sharing Protocol must implement all System Use Entries as defined in this specification.

The implementation shall be capable of reading the set of System Use Entries that is specified in this standard from a Volume Set in accordance with one of the interchange levels specified in ISO 9660.

Any System Use Entry which the receiving system does not recognize shall be ignored and skipped. Any System Use Entry, with the exception of the set of System Use Entries defined in this document, following an "ES" System Use Entry that indicates an extension specification which the receiving system does not recognize shall be ignored and skipped.

6.3 Implementation Suggestions

For special cases, receiving systems are encouraged to provide a mechanism to optionally disable the System Use Sharing Protocol in its entirety.

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7. BIBLIOGRAPHY

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