SYSTEM USE SHARING PROTOCOL

VERSION 1

A MECHANISM FOR EXTENSIBLE SHARING OF ISO 9660:1988 SYSTEM USE AREAS

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Revision 1.09

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PROPOSAL

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1. PREFACE

1.1 Purpose and Scope

The ISO 9660:1988 CD-ROM format provides System Use Areas within the Directory Records to support convenient extensibility of the specification. Unfortunately, no mechanism for coordinating shared use of these areas was provided. This has led to very restricted and non-standardized use of these areas. It is desirable to develop the following proposed standard for shared utilization of the System Use Areas provided by ISO 9660.

1.2 Summary of Sections

Section 1	Contains this 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 Fields provided by the SUSP.
Section 6	Contains the SUSP Application Programming Interface.
Section 7	Contains the bibliography.

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 Areas provided by ISO 9660:1988 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 Fields 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

3. TERMINOLOGY AND NOTATION

It is assumed that the SUSP is being utilized within an ISO 9660:1988 compliant volume. Unless defined herein, or otherwise specified, terms shall be as defined in ISO 9660:1988.

The following notation is used in this document.

3.1 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. E.g. the hexadecimal number 7F will be written as (7F).

3.2 System Use Areas

ISO 9660:1988 provides System Use Areas 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 Areas within the Directory Records.

In the descriptions in this document, the phrase "System Use Area" shall refer equally to the System Use Areas specified as well as any Continuation of the System Use Areas designated through the use of "CE" System Use Fields (CE is described in the section titled "SYSTEM USE FIELDS PROVIDED BY THIS SPECIFICATION").

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 Fields. There may be zero or more System Use Fields in each System Use Area. Each System Use Field is identified by a System Use Field Signature Word (described below).

More than one System Use Field with the same signature word is allowed, unless otherwise specified in the definition of a specific System Use Field. If allowed, the significance of the order, if any, of the recording of multiple System Use Fields with the same signature word shall be specified in the definition of the particular System Use Field involved. In all other situations, the order in which the System Use Fields appear is not significant.

Unless otherwise specified in the definition of a specific System Use Field, each System Use Field 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 Field with the same signature recorded for any other extent of the file. Thus, unless an alternate mechanism is provided in the definition of a specific System Use Field, failure to record a valid instance of the System Use Field 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" field, which is recorded as specified in section 5.3, the first System Use Field recorded in a System Use Area of any Directory Record shall begin in byte LEN_SKP+1 of the System Use Area (see section 5.3 [5]). The first System Use Field recorded in any Continuation of a System Use Area shall begin in the first byte of the Continuation. If more than one System Use Field is to be recorded in the same System Use Area or Continuation, they shall be recorded contiguously.

If the remaining allocated space following the last recorded System Use Field in a System Use Area is less than four bytes long, it cannot be a System Use Field and shall be ignored. Otherwise the use of the System Use Sharing Protocol should be terminated by the "ST" field or filled with the "PD" field, which are described in Chapter 5.

4.1 System Use Field Format

The System Use Field format is as follows:

[1] "BP 1 to BP 2 - Signature Word" shall specify an identification of a System Use Field. This field shall contain two bytes. Each byte is recorded according to the ISO 9660:1988 Format Section 7.1.1.

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

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

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

TABLE 1. System Use Field Description - Version 1

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

5. SYSTEM USE FIELDS PROVIDED BY THIS SPECIFICATION

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

"CE"	Continuation Area
"PD"	Padding Field
"SP"	System Use Sharing Protocol Indicator
"ST"	System Use Sharing Protocol Terminator
"ER"	Extensions Reference

5.1 Description of the CE System Use Field

The purpose of the "CE" System Use Field is to extend the System Use Area to store additional System Use Fields. The "CE" System Use Field is optional. There is at most one "CE" System Use Field in a System Use or Continuation Area.

The entire single Logical Sector which begins with the Logical Block referred to by a "CE" System Use Field shall be used as an additional System Use Area. The recording in any Continuation of the System Use Area shall follow the Format of the System Use Area as described in the previous section of this document. All Continuation Areas identified by "CE" fields must reside on the same Volume as the "CE" field. If additional space is needed, the Continuation of the System Use Area identified by a "CE" System Use Field may contain another "CE" System Use Field designating another Continuation of the System Use Area. The "CE" System Use Field indicates a Continuation Area that should be processed after the current System Use Area or Continuation Area is processed.

Note: For maximum compatibility with pre-existing systems, system use fields which predate this document should not be recorded within Continuation Areas.

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

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

[2] "BP 3 - Length (LEN_SUF)" shall specify as an 8-bit number the length in bytes of the "CE" System Use Field. The number in this field shall be 28 for this version. This field shall be recorded according to the ISO 9660:1988 Format section 7.1.1.

[3] "BP 4 - System Use Field Version" shall specify as an 8-bit number an identification of the version of the "CE" System Use Field. The number in this field shall be 1 for this version. This field shall be recorded according to the ISO 9660:1988 Format section 7.1.1.

[4] "BP 5 to BP 12 - Location of Continuation of System Use Area" shall specify as a 32-bit number the Logical Block Number of the first Logical Block of the Logical Sector that contains the start of this Continuation of the Sytem Use Area. This field shall be recorded according to the ISO 9660:1988 Format section 7.3.3.

[5] "BP 13 to BP 20 - Offset to Start of Continuation" 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 of the System Use Area. This field shall be recorded according to the ISO 9660:1988 Format section 7.3.3.

[6] "BP 21 to BP 28 - Length of the Continuation" shall specify as a 32-bit number the number of bytes that are to be used for this Continuation of the System Use Area. This field shall be recorded according to the ISO 9660:1988 Format section 7.3.3.

TABLE 2. CE System Use Field - Version 1

'C' (BP1)	'E' (BP2)	28 (BP3)	1 (BP4)	LOCATION (BP5 to BP12)	OFFSET (BP13 to BP20)	LEN of CONTINUATION (BP21 to BP28)

5.2 Description of the PD System Use Field

The purpose of the "PD" System Use Field is to provide flexibility. The "PD" System Use Field is optional. There may be more than one "PD" System Use Field in a System Use Area. The "PD" System Use Field(s) may appear anywhere in the System Use Area.

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

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

[2] "BP 3 - Length (LEN_PAD)" shall specify as an 8-bit number the length in bytes of the "PD" System Use Field. This field shall be recorded according to the ISO 9660:1988 Format Section 7.1.1.

[3] "BP 4 - System Use Field Version" shall specify as an 8-bit number an identification of the version of the "PD" System Use Field. The number in this field shall be 1 for this version. This field shall be recorded according to the ISO 9660:1988 Format section 7.1.1.

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

TABLE 3. PD System Use Field - Version 1

'P' (BP1)	'D' (BP2)	LENGTH (BP3)	1 (BP4)	PADDING AREA (BP5 to LEN_PAD)

5.3 Description of the SP System Use Field

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

The "SP" System Use Field is mandatory. The "SP" System Use Field must be recorded starting in byte position one (BP 1) in the System Use Area of the first Directory Record of the root directory of each directory structure in which the System Use Sharing Protocol is utilized. Only one "SP" System Use Field should be recorded within a single directory structure.

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

[1] "BP 1 to BP 2 - Signature" shall indicate that the System Use Field is a "SP" type System Use Field. 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 Field. The number in this field shall be 7 for this version. It shall be recorded according to ISO 9660 Format section 7.1.1.

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

[4] "BP 5 to BP 6 - Check Bytes" shall contain two check bytes. The value of the bytes recorded in this field shall be verified in interchange. 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 Area of each Directory Record (except the "." entry of the root directory) before recording System Use Fields other than the "SP" field. The number in this field shall be recorded according to ISO 9660 Format section 7.1.1.

TABLE 4. SP System Use Field - Version 1

’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 Area, the contents of BP 1 to LEN_SKP of the System Use Area of each Directory Record are not restricted by this specification.

5.4 Description of the ST System Use Field

The purpose of the "ST" System Use Field is to provide a terminator for the use of the System Use Sharing Protocol for a particular System Use Area or Continuation Area. The "ST" System Use Field

indicates the completion of any information that conforms to the System Use Sharing Protocol within the particular System Use or Continuation Area. The "ST" System Use Field is optional.

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

[1] "BP 1 to BP 2 - Signature" shall indicate that the System Use Field is a "ST" type System Use Field. 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 Field. The number in this field shall be 4 for this version. It shall be recorded according to ISO 9660 Format section 7.1.1.

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

TABLE 5. ST System Use Field - Version 1

'S' (BP1)	'T' (BP2)	4 (BP3)	1 (BP4)

Note: The Data field of the System Use Field is optional, thus it is not used in the "ST" System Use Field.

5.5 Description of the ER System Use Field

The purpose of the "ER" (Extension Reference) System Use Field is to store information which (uniquely) identifies a specification of system-specific extensions utilized on a specific volume.

Whether this System Use Field is mandatory or optional shall be specified by each complying system-specific extension specification. Multiple copies of this System Use Field may occur specifying the encoding of multiple collections of system-specific extensions used within a single directory structure.

This System Use Field, if recorded, must appear in the System Use Area of the first ("dot" or (00)) Directory Record of the root directory of the directory structure in which the system-specific extensions to which this "ER" System Use Field refers are used.

It is the responsibility of the Publisher to avoid or resolve conflicts between different system-specific extensions utilized on their publications.

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

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

[1] "BP 1 to BP 2 - Signature Word" shall indicate that the System Use Field is a "ER" type System Use Field. 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 Field. The number in this field shall be 8 + LEN_ID + LEN_DES + LEN_SRC for this version. This field shall be recorded according to the ISO 9660:1988 Format Section 7.1.1.

[3] "BP 4 - System Use Field Version" shall specify as an 8-bit number an identification of the version of the "ER" System Use Field. The number in this field shall be 1 for this version. This field shall be recorded according to the ISO 9660:1988 Format section 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 Field. This field shall be recorded according to the ISO 9660:1988 Format Section 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 Field. This field shall be recorded according to the ISO 9660:1988 Format Section 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 Field.. This field shall be recorded according to the ISO 9660:1988 Format Section 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 Field refers. The number in this field shall be specified by the organization which defined the extensions to which this "ER" System Use Field refers. This field shall be recorded according to the ISO 9660:1988 Format Section 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 9660:1988 section 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 Field 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 9660:1988 section 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 Field refers. Recording of information in addition to any such minimal information specified shall follow the recording of said 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 9660:1988 section 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 Field refers. Recording of information in addition to any such minimal information specified shall follow the recording of said information.

TABLE 6. ER System Use Field - Version 1

'E' (BP1)	'R' (BP2)	LENGTH (BP3)	1 (BP4)	LEN_ID (BP5)	LEN_DES (BP6)	LEN_SRC (BP7)	EXT_VER (BP8)

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

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

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 a set of System Use Fields in System Use Areas that are specified in this standard, on a Volume Set in accordance with one of the interchange levels specified in ISO 9660:1988.

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 a field 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 the "CE" System Use Field as defined in this specification.

Any System Use Field which the receiving system does not recognize is to be ignored and skipped.

The implementation shall be capable of reading a set of System Use Fields in System Use Areas that are specified in this standard from a Volume Set in accordance with one of the interchange levels specified in ISO 9660:1988.

The implementation shall allow the user to supply information sufficient to enable the implementation to locate the System Use Fields in System Use Areas required by the user, and to locate the volumes on which these are recorded.

The implementation shall make available to the user the information that is recorded in each of the System Use Fields in each System Use Area.

6.3 Requirements for an Application Programming Interface

All receiving systems which claim to implement the System Use Sharing Protocol must implement an Application Programming Interface (API) to provide access to the information recorded in the System Use Areas within a volume.

The API must provide a mechanism to verify the use of the SUSP (by checking for the existence of a valid "SP" field) and retrieve data recorded in the System Use Areas within a volume. The mechanism must, at a minimum, be able to retrieve, for each Directory Record:

- a complete, individual System Use Field, including all header information, selectable by Signature, field count or both; and,
- the contents of the Skip Area, BP 1 to LEN_SKP of the System Use Area of the Directory Record.

Optionally, the API may also provide a mechanism to retrieve, for each Directory Record:

- a concatenated collection of all fields with a specific Signature in recorded order; or,
- a concatenated collection of all fields in recorded order.

The mechanism to retrieve such data must be able to correctly and transparently interpret pertinent "CE" System Use Fields to assure the complete retrieval of the requested data.

6.4 Coexistence with other Extensions and SUSP Registry

Adherence to the System Use Sharing Protocol provides for the mutual coexistence of different system-specific extensions to ISO 9660:1988 by defining System Use Fields to be recorded in System Use Areas.

A registry system will be established to monitor and record existing and new System Use Field specifications and distribute this information to individuals or organizations pursuing the implementation of new and/or compatible system-specific extensions.

6.5 Implementation Suggestions

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

7. BIBLIOGRAPHY

- ISO 9660:1988 - Information Processing - Volume and file structure of CD-ROM for information interchange
- Wong, T. September 12, 1989. Extensions to the ISO 9660 CD-ROM Volume and File Structure Format to support POSIX File System Semantics.

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