

CD-ROM STANDARDS ISSUES: INTERNATIONAL CD-ROM STANDARDS: CREATION AND MAINTENANCE

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Abstract: This paper reviews what standards are in place for, or in use with, Compact Disc Read Only Memory (CD-ROM). It suggests areas of change and/or refinement to these standards. The paper describes the activity or process governed by each standard, its advantages and drawbacks and the implications or relevance of its use. Also, it addresses the requirements for maintenance of the existing, and creation of new, CD-ROM standards. These include hardware, software, and firmware issues.

1. Introduction

Many CD-ROM users, developers, and producers consider that the compact disc standards in place are behind the times, especially with regard to interface specifications. The standards are clearly in transition with emerging technologies setting new benchmarks regularly. These demands come from not only CD-ROM XA (extended architecture), but also from CD-I (intercative), CD-Audia, DVI (digital video interactive), among others, as multimedia continue to make advancements.

The CD-ROM industry needs standards that promote incorporation of technological advancements, quicker access, are easier to update, and move across platforms from UNIX to DOS to Windows to Mac, etc. To accommodate accelerating demands, vendors are providing consumers with state-of-the-art solutions for their multimedia needs in the optical environment. These state-of-the-industry concepts, approaches, and technology must be considered as standards evolve or are further developed. Higher quality and better performance of data in image form is required to fully address this challenge. User defined graphics-related materials need to have better compression techniques, must be carefully scanned (with rigid quality assurance), and perhaps linked to a keyword index to take full advantage of these developing technologies. A lack of image and compression standards hampers implementation of newer technology

2. Hardware

The approval of NISO Z39.60 in the mid-1980s created a formal standard that established the volume and file format specifications for optical media of a read-only nature. This standard helped to create a foundation for the integration of CD-ROM into various computer operating systems. It aided the transition from the prototype structures of private firms or industry groups to a broadly accepted standard.

The process of transition from High Sierra Group's "wide-open" standard to Information Standards Organization 9660 is more or less complete. It could be considered wide-open due to the informal manner in which it was created, a meeting of early industry players at a hotel high in California's Sierra Mountains. By comparison, the adoption of ISO 9660 was much more formal although modifications to High Sierra were not all that extensive. The main difference was centered on the inclusion of extended attribute records capability. This helped to open it up to system that did not conform to DOS file parameters. As earlier mentioned, while the transition to a great degree is over, some vendors continue to offer High Sierra Standard and many CD-ROM drives are in place with that standard.

Pressure is always there to retain elements of older technology via standards. This collides with the countervailing pressure of new techniques and technologies that are attempting to meet the growing demand for better CD-ROM applications. These interests must be fully weighed and the implications considered if the industry is to develop in an orderly fashion. If the various issues are not addresses in a comprehensive manner certain technological inventions or innovations may be delayed, never enter a mainstream market, or sometimes create a new fast-growing area that standards have to race to catch up with it.

Multimedia enhancements are pushing back (and blurring) the boundaries of communication/media types. By adding various multimedia components, CD-ROM products are becoming more responsive and, therefore, appealing to a much broader range of information and entertainment consumers. For example, audio, video and even still images were not associated with textual material on compact disc a few years ago but are increasingly integrated now.

Integration of textual material with graphics, audio, and video has heightened the awareness of end users to the expanding possibilities associated with CD-ROM. The standards must quickly incorporate new developments so as not to impede their introduction or allow de facto standards to remain for extended periods of time.

ISO 9660 covers the physical structure aspects of CD-ROM. That is, it dictates a specific method for writing of data to the CD itself. In addition, the standard contains logical file format specifications. This is a great aid because it allows CD-ROMs to be portable from platform to platform. Depending on the developer or publisher, a disc could be used with DOS, MAC, UNIX, or Windows operating system environments as long as the ISO 9660 criteria are met.

The small computer systems interface (SCSI) is the standard for interchangeable CD-ROM drives between systems and is considered by some in the industry as too broad a standard. This due to the fact that the protocol, although technically SCSI compatible, require different software drivers and are therefore not completely interchangeable.

CD-ROM configurations and interfaces are not standardized, with the exception of working with or within the above mentioned specifications. If you use a number of CD-ROM products, they seldom have the same requirements, whether they are related to a single discipline or for general review and demonstration purposes.

CD-ROM titles arrive usually with a combination of specifications that are not in place on most systems. For example, some common requirements are a high resolution color monitor, a graphics card that is not included with most machines, and a relatively high amount of RAM. In many instances these requirements are not for optimal display but define the minimum operational configuration. ANSI/NISO Z39.72-199x (CD-ROM Standard Format for the Submission of Data for Multimedia CD-ROM Mastering) is under development. The draft version was out in 1992 and is currently being circulated for comment by all interested parties.

3. Software

Each type of software for search and retrieval applications presents the user with a different interface. Even if the basic functions are virtually identical the operational procedures will not be the same. These variables extend to the amount of documentation, type of support, level of ease or difficulty during installation.

Most of the attention and effort has gone into the development of standards for the media and hardware, although this is starting to change. An example of this change in emphasis is ANSI/NISO Z39.73-199x (CD-ROM Standard Interface Retrieval Protocol) is in development with a chair appointed in 1991 and a draft still in production.

4. Text Input Standards

The character set that is standard for full-text data is the American Standard Code for Information Interchange (ASCII). No data conversion work is required when using ASCII as opposed to the EBCDIC character set. Nor is special display or print related hardware is needed for normal output.

The development of standard formats has aided the interchange of data from different information sets or types. The Z39.2 standard provides data interchange of bibliographic text using a Machine Aided record cataloging (MARC) record structure. This standard is maintained by the MARBI Committee of American Library Association.

Tagging of text permits the attachment of value and /or description and is a way to identify a specific data element. The process of tagging allows for quicker location and manipulation of a particular section of data in a database. Advantages include faster search and retrieval (by creating inverted indices), merging of data, or as a processing aid in creation of a print product.

Tagging text in a very structured manner facilitates its use in different compact disc environments. Structured tagging allows the text to produce any number of electronic or print products. It allows fast creation of output from databases in addition to aiding end users to perform searches of flat files, relational, or object oriented databases.

Because of the need for multiple output formats, non-standard custom formats abound, although a number of adaptable standardized tagging schemes have been developed over the years. The standardized schemes vary in complexity, flexibility, acceptance, and expansion capability or a combination of these factors.

SGML is becoming more popular due to the fact that it addresses these aforementioned factors. The various MARC formats (such as LC-, US-, UK-, FINN-), left-tagged, and comma-delimited formats are among the other options.

Some years ago the United States Department of Defense mandated standards via Computer-aided Acquisition and Logistic Support (CALs). One facet of the CALs' initiative is Standard Generalized Markup Language (SGML) MIL SPEC M-28001 A under ISO 8879, a scheme that marks each data element as a distinct entity, including type style and size, thereby preserving it for future applications. Z39.59-1988 provides an application of SGML by specifying the syntax of generic tags and predefined tags for the most common manuscript elements. Z39.59-1988 is currently under a five year review and will be withdrawn and replaced by ISO 12083.

The decision to use SGML as a tool to enhance CD-ROM databases will make this technology a much stronger player in the publishing arena. The addition of SGML to a CD-ROM database will increase its appeal as publishing device. Creation of a Document Type Definition (DTD) and implementation can be time consuming and costly. A cost/benefit analysis should be considered before committing to this additional enhancement work. Standards that were initially developed for the publishing industry have cleared the way for the creation of software to manipulate text for different applications. Software is available with the capability of holding the information in a manner that allows for searching of flat files or in a relational mode, but also will maintain the data with print attributes for publishing activities.

Publishing activities may include generation of proprietary documentation and manuals for inhouse consumption or camera-ready copy for commercial book publishing ventures. With a compatible printer configuration the equivalent of chapters, complete documents, or entire books can be generated from the disc with output that contains actual publishing characteristics such as special symbols, bolding, underlines, variable types sizes and styles (Italics, Times Roman), etc.

Considering the information needs of your organization along with the amount of effort required to implement a set of standards may or may not simplify the CD-ROM implementation task. Choosing the most appropriate path by linking these various options together is the difficult part in producing a high quality CD-ROM product.

5. Images

User defined graphics-related materials (line art, bar charts, half-tones, graphs, etc.) add a new dimension to databses that previously contained only textual information. Databases have been further enriched by including very high resolution images with greyscale or color up to 256 levels. These images will provide a much clearer and stronger presentation of the information on the CD.

Standards beyond bit structure and compression specifications need to be put in place to insure high quality output to an image form. Imaging provides a relatively inexpensive way to capture graphics or even pages of text into bit-mapped format. However, if the scanning process is not handled properly the images may be of little or no use. Depending on the application, degradation or corruption of the images vis-a-vis the source documents may render the output worthless. Output with data that is missing or difficult to read will quickly turn off a prospective end user.

Image formats such as TIFF, PCX, and DIF have become de facto standards within the industry. Software developers have chosen to support one or two of these "standards". A number of CD-ROM developers support the most popular compression algorithm standards which are those set by the Consultative Committee for International Telephony and Telegraphy (CCITT). Monochrome and greyscale images are easily handled by CCITT Group III and IV. These may sound familiar because they are in use as fax transmission standards.

To avoid problems with color photographs a different type of compression - JPEG is recommended. This standard was developed by the Joint Photographic Experts Group of ANSI and is the most commonly used compression for these applications because it accomodates continuous tone still images that are very dense. The Association for Information and Image Management (AIMM) has begun standards development on File Format for Storage and Exchange of Continuous Tone Images. It will address the header information required to exchange bi-level JBIG and greyscale JPEG images.

6. Audio/Video

The Motion Picture Experts Group has set a standard (MPEG) that includes audio and video routines for CD-ROM. Developers are using this standard for their upcoming products. As an example, NIMBUS Information recently completed development on its CD video technology. Nimbus used a C-Cube MPEG-1 chip for its converter that decodes the compressed video and audio signals.

7. Performance

The introduction of compression (encoding) and decompression techniques have improved compact disc performance. Retrieval time declines while storage capability is increased.

For instance, CD-ROM Inc. recently announced the release of a driver that compresses and writes data to CD and is able to access it from there. The greatest impact of these software algorithms and firmware/hardware designs has been on bit-mapped image storage, especially when a grt number of images are involved and/or where the resolution and levels of color or greyscale are very high.

The value of images on CD-ROM can be enhanced by the addition of an index file. This provides a more accurate portrait of the database and the information available to each searcher. It further assists the user by limiting the amount of effort required to find more relevant information.

Creation and linkage of an ASCII keyword index to an image database will decrease search and retrieval time by allowing users to access the ASCII file to locate probable hits. Adding or updating a keyword index to a textual database is a way to add value to the information. NISO Z39.19-199x would be applicable for developing a thesaurus needed to implement a system to generate key word index terms.

Editorial enhancements are accomplished through the use of editorial staff, automated routines (machine aided indexing) or a combination of the two. Crucial factors to be considered are time, uniqueness of the data, and budgetary constraints.

Use of index files reduces the number of instances users must open the relatively bulky (large amount of bytes per file) images. (If it can not be used effectively and efficiently it will not be used or recommended.) Information that is hard to access, or "get at", will not be utilized to its full potential.

Performance (increased speed of retrieval) via encoding standards has not had a great impact on textual collections, with the possible exception of very large full-text databases. A number of other techniques probably have had a greater impact on textual information.

Better data organization and layout along with keyword indexing and tagging methodologies such as hyperlinks and hotlinks promise to further enhance search and retrieval performance. Ways to improve or enhance the ability to locate non-textual material on CD is currently under consideration. This probably indicates that indexing of video files is on the horizon.

8. Media/Data Delivery

Delivery of data (text, graphics, audio, video, and film) on a single standard from the media types available for premastering and mastering activities would represent another step forward in the CD processing arena. Media such as Exabyte- or 4mm RDAT are likely candidates. The MPEG standard addresses DATs and nine-track, among others. These newer technologies will move the industry toward a more economical and reasonable medium of storage and transfer.

9. Text Integrity Standards

Accuracy of textual material on CD should be addressed. Much search time will be wasted (with fewer hits generated) if the data is below a certain level of accuracy. Documents in poor condition generally lead to images of diminished quality that then produce OCR output with a low level (approximately 99.0% or less) of

format and content accuracy. Low accuracy levels translate into large amounts of programming and editorial time to clean up the data.

If data titles need to be at what is considered the information industry's unofficial standard of 99.9% (five errors per 10,000 ASCII characters) the amount of time and money expended for clean-up would outweigh the higher up front charge for keyboarding. Careful analysis of each project and its unique documents, output format, time frame, and required accuracy level should be taken into account before the method of text capture is chosen.

Ultimately, an typographic accuracy standard for text presentation will produce higher quality databases regardless of whether they are full-text, fielded, image only, or multimedia.

10. Maintenance of Standards

The various agencies and standards bodies provide maintenance for each standard that has been developed. These include but are not limited to NISO, AIIM, ISO, ANSI, and X3. A request may be made to revise a specific standard. It is then commented on or circulated for comment and is voted upon by that respective body. A draft is generated and regenerated until all negatives and comments are resolved. The draft is revised and voted on for final approval. These activities can include the withdrawal of a standard. A standard is automatically revised, reaffirmed or withdrawn every five years.

Prompt updating of standards is essential to reaching the full potential implementation of these numerous technologies and procedures. This allows developers to offer a more complete service area via text, graphics, video, audio, etc. while taking advantage of the great storage capabilities associated with CD-ROM technology.

11. Creation of New Standards

Standards are written with the end user taken into account. To create a new standard NISO for example has a Standards development Committee that oversees the standards development process. 1) Each project to be submitted should have a descriptive title. 2) The proposer (individual or organization) should include address, telephone, facsimile, e-mail address, organizational affiliation. 3) The data of project submission. 4) Justify the proposed project. This may be accomplished by identifying the need for the project and the problems that it is intended to address. Who would be interested or care about this subject? 5) Describe the scope and application of the proposed standard. Include an estimate of the amount

of resources needed such as time, money, and skill or talent to develop the proposal into an American National Standard. 6) Examine the implication on users moving to the new standard. 7) If available, attach draft document on which the standard can be based. 8) Identify closely related standards activities. 9) Include which NISO or other organizations should serve on the committee. 10) What type of funding might be available for the project. After a standard has reached consensus in one country it is brought forward for international consideration.

Designing a standard for is an area that will help end users. This could be done by establishing a protocol that would include interface and field tag specifications. A set structure for database files will allow users to become accustomed to seeing certain data types such as author, title, date, keywords and so on in standard placement. This will allow end users to more readily get "up to speed" when accessing a new or seldom used database. Among the other topics that might be considered for standards work are file design, accuracy, device driver, interface, authoring, hypertext, hot link, and network standards.

12. Conclusion

Standards development helps resolve the issues in any area. Consensus on techniques and procedures have helped to push the quality of CD-ROM databases to a higher level. They have increased this medium's value by reducing the cost for access to large amounts of data while generally improving the search and retrieval response time. Standards have helped further the integration of CDs into the mainstream of information tools by aiding entrance to a large installed user base.

These preparation activities have elevated the medium by effecting a more concise, comprehensive, and pleasant presentation of computerized information collections. As this segment of the information industry grows, it may be assumed that further progress will be made in the development of tools and techniques that will drastically enhance performance and data capacity per disc. At the same time, the cost for capture and manipulation will probably level off or decrease.

This trend toward better performance and more information per disc will no doubt spur greater acceptance among current end users of database products and bring additional users from the public at large. Also, it should accelerate the movement towards more open standards that are broader, more flexible, and more encompassing to accommodate these new technologies.

Interested persons are invited and strongly encouraged to participate in the standards development process. Working with standard groups such as ISO, NISO

(Z39), AIM (MS) and CBEMA (X3) will enable better procedures and products to reach consumers in less time.

The issues will continue to be resolved and aided by a responsive standards process.

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