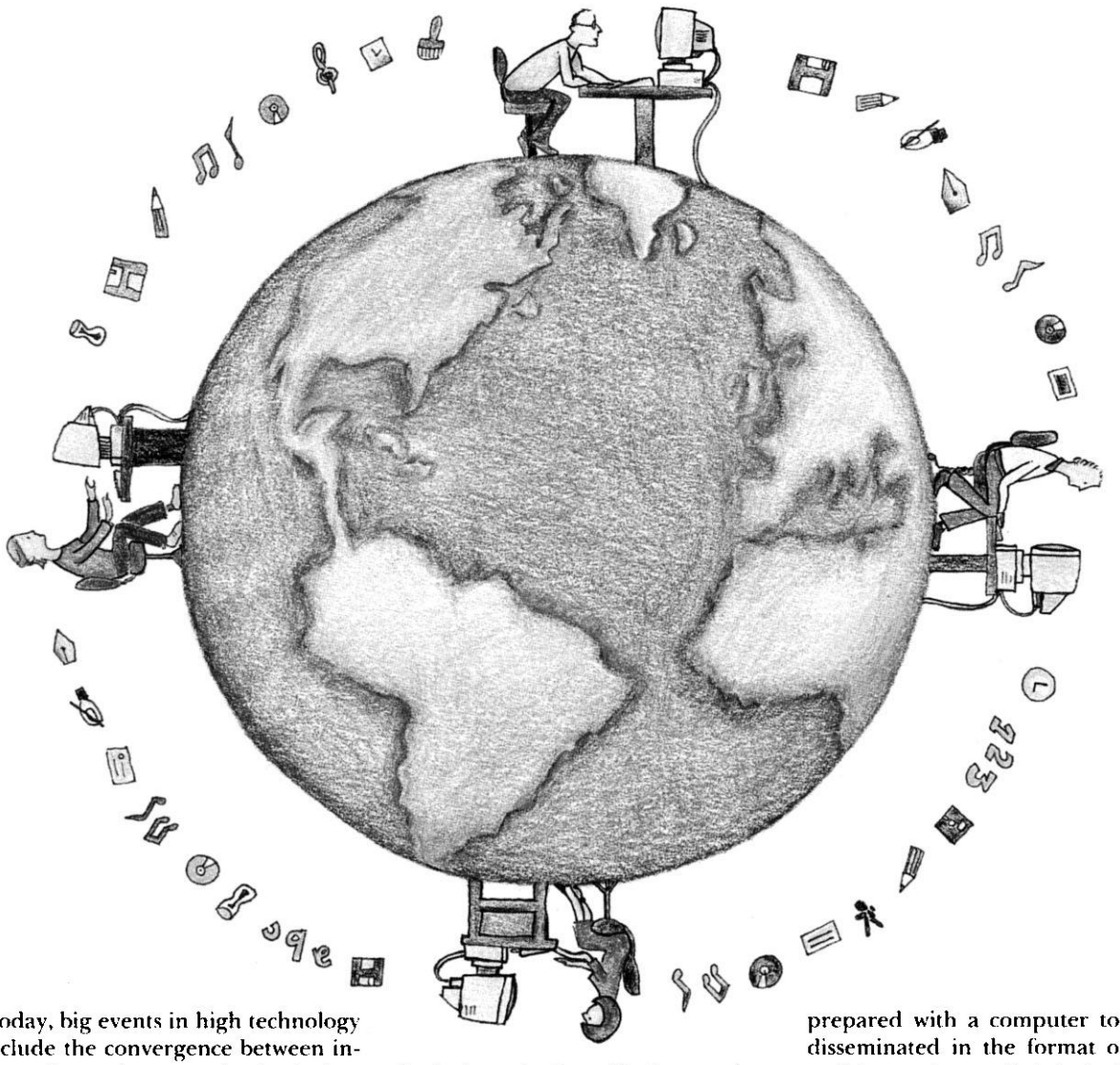
The New Media



Today, big events in high technology include the convergence between information and communication industries (computer, telephone, cable television, and broadcast television), the emphasis by such giants as Microsoft on hypermedia products, and the manufacture of palmtop computers. In this new age, a field engineer may access a simulation of a plane engine on a palmtop computer while in the process of repairing the engine. A student at home writes an essay on a palmtop and incorporates moving images from a hypermedia encyclopedia into the essay before electronically mailing it to the teacher. When will this new age come and what hinders its progress? Do the lack of standards impede the effective production or access of the new media?

Consider the production and dissemination of a document with text and images. For a paper document, whether the author uses a pen, a typewriter, or a computer, so long as the final product is legible on paper and can be reproduced, the availability of the product is not a technological matter. If the document is to be disseminated electronically and is prepared with a computer tool and disseminated in the format of compatible versions of that tool, then often only people with that tool can access the document.

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Existing Standards

The content, such as text and graphics, is an important aspect of a document. But it is how content portions are related to each other and how they are presented to a human viewer that is the essence of a document. The way that portions of the document are placed on the page—the size of characters, the margins, the position of images—is the physical structure or layout. By identifying the application-specific meaning of por-

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tions of the content we add the logical structure. For example, portions of text might be identified as being the title while other portions are identified as the section titles and figure captions. Such logical structure is often added to the content as "markup."

Standards for logical layout have been specified in the Standard Generalized Markup Language (SGML) and in other standards. Electronic publishers have widely endorsed SGML, but popular document processing tools such as Microsoft Word and WordPerfect, have been slow to provide SGML support. This is due, in part, to the difficulties of integrating 'What You See Is What You Get' and structure-based styles of document composition into a single new paradigm that is easy to learn.

The challenges of dealing with documents are increased when one deals with multimedia and hypermedia. Media are distinguished by various characteristics, such as the sensory pathway through which they are perceived (e.g., audio vs. video), the technology utilized in their presentation (e.g., broadcast television vs. computer displays) and the way they change over time (e.g., still images vs. full-motion images.) The synchronization of text, moving images, and other media constitutes multimedia. When multimedia is augmented with computer-mediated interactivity, hypermedia exists.

In production of dissemination of electronic documents, numerous standards must be considered. In dealing with hypermedia even more standards may apply. Computerized, moving images and sound may be encoded in a multitude of formats. An application of SGML called HyTime is being used for logical markup of hypermedia.

Additional progress continues to be impeded by several factors. First, there is no universal agreement on the logical structure of common "office" documents. On the other hand, the professional publishing community has made great strides at interoperability in the past few years by defining such standard descriptions, called Document Type Definitions in SGML parlance. Second, given that the logical structure of a document has been captured, there is no widely accepted standard way of describing how that information is to be presented. In the case of word processors, this means that a standard format is needed for style sheet exchange.

As long as platforms continue to be distinguished by differing abilities to process various media (a major marketplace differentiator!), there will continue to be good technical reasons for having native media formats that are closely matched to platform-dependent interfaces. It is this, rather than any antistandards bias, that has led to the definition of different media formats and will continue to lead to the definition of new formats in areas where technology is rapidly progressing. There will continue to be good technical reasons for matching media distribution formats to the native formats of media players.

If you are a user of a certain tool, then, in theory, you can create and access information in any format the tool supports. In practice, there are often problems in interchanging your information with others, even if you only use a different version of the tool or have different platforms or environments where you run it (e.g., different installed fonts.) If you want to give your information to someone who does not use your tool, then either the two different tools must be able to use each other's native formats or you must use a multivendor interchange format.

Converters

The lack of agreement as to which standards or formats are best poses a dilemma for users of hypermedia. One approach to this problem relies on converters. Several document processing tools, such as Microsoft Word, are good at converting various image formats into a form which Microsoft Word can display.

The value of being able to exchange documents among word processing applications has led Microsoft to move in the direction of providing more compatibility between Microsoft Word and SGML. WordPerfect is capable of exporting and importing documents with SGML markup. One of the prominent features of the Interleaf document process system is its ability to handle SGML logical markup.

Standards and conversions are not antithetical. If converters can go from a nonstandard to a standard format or from a standard to a nonstandard format, then the standard still plays an important role. Given n formats, about 'n times n' converters would be needed to allow a person using any format i to convert to any other format j. By using one standard as an intermediate, then the number of converters which is needed is reduced by a factor of '1 over n'.

If a converter exists between each nonstandard format and the standard format, then going from any nonstandard format to any other nonstandard format can be accomplished by going first to the standard format. For instance, if one had 10 different hypermedia logical markups and wanted to convert between any two, then one way is with 100 converters that go pairwise between each two. Alternately, one intermediate format, such as HyTime, can be used, and then only on the order of 10 conversion programs are needed (see Figure 1).

There are many different types of formats (graphics, video, text/character, logical). In converting documents between hypermedia systems, you typically have to convert more than the logical format, which might be represented in an intermediate markup language such as HyTime. Each hypermedia system will support its own preferred media formats. To convert a document from one hypermedia system to another, each media component within the document may have to be separately converted.

To completely convert documents between two hypermedia systems, the systems must support the same hypermedia features. This is not now, has never been, and never will be the case in an evolving market. As long as products continue to have different feature sets, conversions from one to another will be less than 100% effective. Feature-based product differentiation is a characteristic of all growing markets, such as computer software. Conversion success can be enhanced by limiting product use to only common features or by direct translation from one format to an-

other without going through an intermediate standard format. Neither of these strategies is entirely acceptable.

The '*n* times *n*' count assumes that all formats will be needed. Actually, only one or a few converters might be required to move a hypermedia document from one system to another system! Only a person who desires maximum flexibility—such as a conversion service—would need all '*n* times *n*' converters.

There are only a relatively small number of important commercial products and a small number of platform-dependent formats. The market-leading products import at least some format that the others export. If a product does not do this, it can not gain market share. In the case of integrated, vector-raster formats, there are only a few high-volume, commercially important formats. Industrial-strength products support all of these with translators to/from their own native formats. There is a host of third-party translators to support lower-volume and special-purpose formats.

Who should be responsible for doing conversions? There are formats at different interfaces (the author-publisher interface, the publisher-user interface, and so forth). The author or the publisher could provide a different version of hypermedia documents for each different hypermedia system of market importance for the particular document. Or the user might find hypermedia products not in the format of the user's system and be prepared to convert the product. Economic factors will typically determine who does the conversions.

Container formats

If you believe that internal formats and interchange formats are and will continue to be different, then there are converters in every product that supports standards. This excessive need for converters may be remedied as well as it ever can be solved by new generation interchange formats, such as OpenDoc, which allow private objects and structure to be described on an equal footing with public ones. In time, this may allow all applications to "interpret" those parts of each other's formats that they can understand.

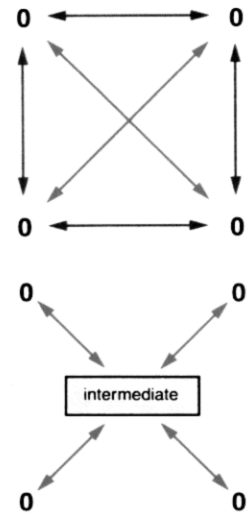

Figure 1. With four different end-user formats and no intermediate format, 12 converters might be needed for dissemination. With an intermediate format, converters are only needed between the intermediate format and each end-user format—in this case a total of eight converters. As the number of end-user formats increases, so does the advantage of using one intermediate format.

OpenDoc uses open, object-based, container formats and is being developed through an open process by the Component Integration Laboratories consortium. Such open-object formats are combined either with platform facilities that can locate applications or with other code objects that can process a given type of data object. One program can use the facilities of another program to process those objects that it does not handle itself. Thus, someone using a word processor can incorporate in a document a spreadsheet prepared in another package which can communicate via OpenDoc with the word processor. Whenever someone wants to edit the spreadsheet, the spreadsheet program is invoked without terminating the word processing application. Of course, users must have a copy of the spreadsheet program on their system. (Note: OLE is a proprietary Microsoft specification with features similar to those of OpenDoc.)

For the open container format approach to work, both the calling and responding programs—in this example a word processor and a spreadsheet—need to have a common vocabulary that defines the embeddable data objects and how they relate to active objects (and especially to the methods on those objects). By agreeing on a fixed, common vocabulary of methods, the application may treat the responding program as a black box and need not know details of its implementation. The degree of cooperation between the two depends on the complexity of the methods. For example, rendering a graphical object into a fixed frame is simpler than interacting with an object by selecting a portion of a display.

If the industry could agree on one standard format and consistently use it, then products could be created and distributed more easily. But this would involve some agreement among competing interests. Such agreements are not easy to achieve in rapidly evolving fields such as hypermedia and multimedia. The most promising effort to date—the Scripting Language Recommended Practice development work within the Interactive Multimedia Association—has recently fallen apart without reaching agreement.

There are many reasons for this lack of progress. Some blame the immaturity of the hypermedia and multimedia marketplace—which still appears to be many diverse and fragmented niche markets which no single solution can optimally address. Others blame vendors who do not find standardization—especially on a format proposed by another vendor—to be in their economic best interest. For whatever reason, the number of different formats continues to abound. Abilities to convert from one format to another or to handle objects in open container formats will be crucial to the dissemination of hypermedia and multimedia. ■

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