Graphic Arts Industry Standards and their Relationship to Office Automation PDL's

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Abstract: As the American National Standards Institute (ANSI) Image Technology Committee (IT8) begins to take form and provide both recorded media based and on-line interfaces to prepress through its continued development of Digital Data Exchange Standards (DDES), a concern is developing as to the logical interface to the office automation world as represented by the standards making bodies of X3.V1 and CCITT.

Critical technical issues in the development of interfaces between corporate publishing systems and commercial printing systems include the data base size for images, and also concerns relative to text. WYSISWYG text is a difficult and uncertain issue in this interface. This presentation examines the technical reasons as to why this is, and points to some likely future developments in this area.

Digital Data Exchange Standards (DDES) and the Non-Impact Printer Interface

The world of color continues to expand to more and more applications. In the commercial printing and publishing industry it has been expanding at the rate of 10 to 15 percent new pages, compounded annually, for over 15 years. This expansion is expected to continue. Further, with technological improvements, color is beginning to come into being at the word processing level.

Why? Simply put, color sells! Keep in mind that almost all printed material is designed to sell something. This is true whether the document is trying to sell why a budget overrun occurred, why someone deserves a raise, the advantages of a particular car or tooth paste, or a variety of other commercial and consumer products.

Unfortunately color is not a very scientific medium. Each observer gets to pass subjective judgement on color. But from a commercial printing point of view, the most important observer is the one who is paying for the job.

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As presentation and business graphics continue their shift to color, and word processing systems gain color capability, the complex world of color will become even more complex. The traditional interfaces between the commercial printing world and its customers (the corporate and creative communities) will need to be redefined. Further, standardization will need to be brought forward. Currently these worlds interface at the word processing to typesetter level. As graphics, and more importantly color, are added, interfaces will need to be developed that will sensibly accommodate these new requirements.

Standardization in the Graphic Arts

For decades the commercial printing and publishing world has resisted any efforts to develop standards.

However, this has changed with the formation of the ANSI IT8 committee which addresses standards development for prepress data files.[1]

Prepress data is the scanned line work, and pictures, coupled with geometric art, type, and page layout instructions, that are used to construct the data used for making printing plates for the printing press.

The IT8 committee is focusing it's standardization efforts in the following areas:

Data Files	**Media of Transfer**
Pictures	Magnetic Media
Line Work	Tape
Vectors	Disk
Geometric Descriptions	On-Line Interfaces

The draft standards for color pictures and line work on magnetic tape have been completed and are in the ANSI public review process. The work on vector/geometry, and on-line interfaces, is expected to be in draft form later this year.

The standard allows for more than four colors, and has options for a wide variety of color spaces. This standard is driven by the known color requirements of a printing press.

Of particular importance here is the issue of color. Here the UEF00 format[2], that allows for the exchange of color picture data via magnetic tape, addresses the color issue from the perspective of a YMCK color space. Further, the intended dot percentage to actually be printed on the paper, or substrate, is also addressed. The basic parameters addressed by UEF00 are:

Color Space:	YMCK
Pixel Order:	Pixel or line interleave
Grey Scale:	8 bits, linear (positive or negative) (each color) slope reports 0 and 100% intended dot percentage as a value from 0 to 256.
Color Order:	YMCK or CMYK
Orientation:	4 of 8
Scan Density:	For intended use
Size:	In pixels and intended physical size

The Myth of Resolution Independence

It is often said that images can be resolution and size independent. This is only partially true for vector described data (i.e., outline fonts, rules, borders, tints, etc.) and is **patently false** for scanned image such as scanned pictures and line work.

Figure 1 provides a reference point for current resolutions across the printing and publishing marketplace.

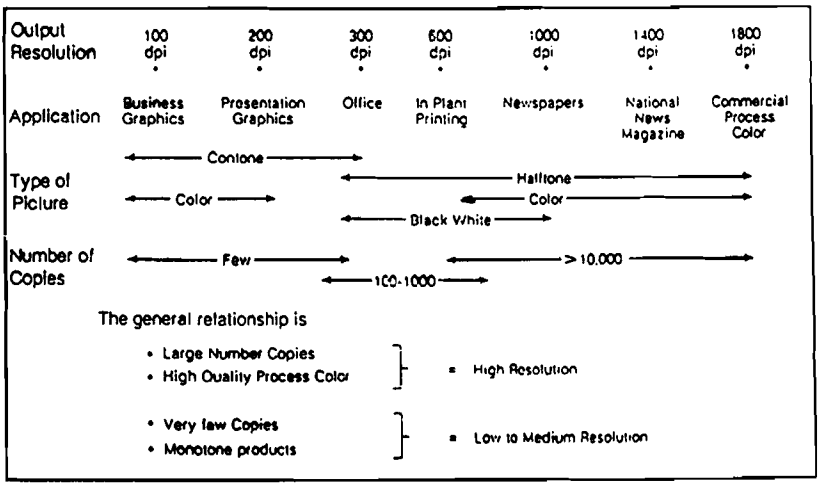

Figure 1: Resolution Across Markets

Figure 2 illustrates a rule of thumb for scanning pictures at intended size of use. This rule has been empirically arrived at through centuries of experience within the graphic arts industry.

An additional word about line screen: For commercial printing (with the exception of the gravure process) pictures are printed as halftones. That is, the continuous tone information (the amount of dye or pigment) in an original image is converted to a spatial area of ink. Inside halftone cells are placed small dots to represent the density (grey level) that one

wishes to print. The number of halftone cells per inch is the line screen. The higher the line screen (up to about 200) the higher the quality of the resulting printed image. *Figure 3* shows a representation of the halftone cells.

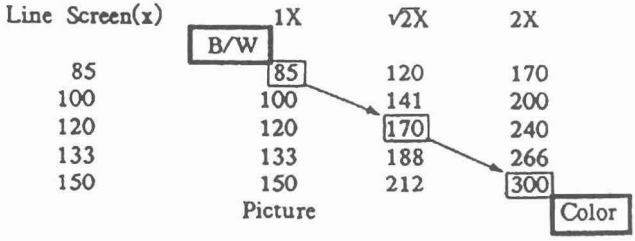

Figure 2: Resolution for Pictures

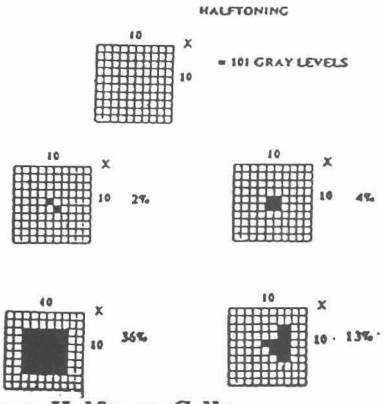

Figure 3: Various Halftone Cells

The scanning density of the output device (compared to the line screen) determines the grey levels that one can print. *Figure 4*, courtesy of Data Recording Systems, Inc., illustrates this point.

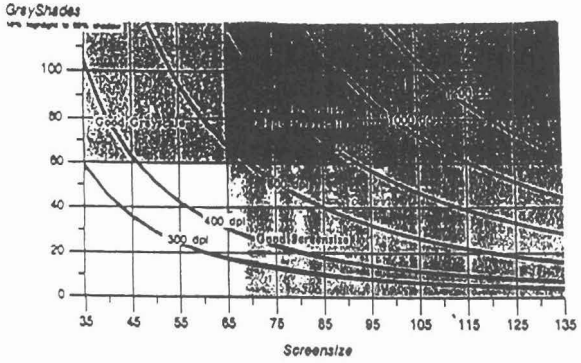

Figure 4: Calculated Resolutions vs. Number of Halftone Shades

All of the above illustrations show the immense amount of data required for print. This is summarized in *Figure 5.*

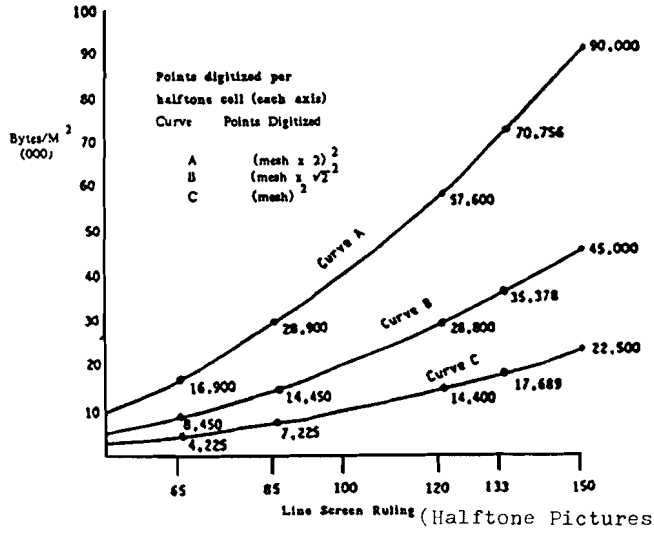

Figure 5: Data Required for Print Per Color

Digital Color and Print Requirements

Returning for a moment to our consideration of color: most digital color for non-printing systems (i.e., slidemakers, paint systems, television animation systems, etc.) has RGB for its color space. Unfortunately (for the print world), most RGB files are special purpose files used to drive displays, image contone color film, etc. These are highly tailored to their intended use (non-print) and carry little or no calibration information with them. As such these files can only be converted to print media files (YMCK color space) by trial and error.

Within printing and publishing the main process control tool is a color proof used to project the printed results. This color proof is subjectively judged and is made from the same data or films that will be used to make the printing plates. The proof is used as a performance target by the press men.

Suffice it to say that going from the use specific RGB world to the subjectively judged YMCK and printing press world will be difficult. But we must, and will, bridge these difficulties.

Bridging the OA and CEPS Worlds

Today's world is becoming complex as all segments of the economy wish to participate in the preparation of data for print (*Figure 6).*

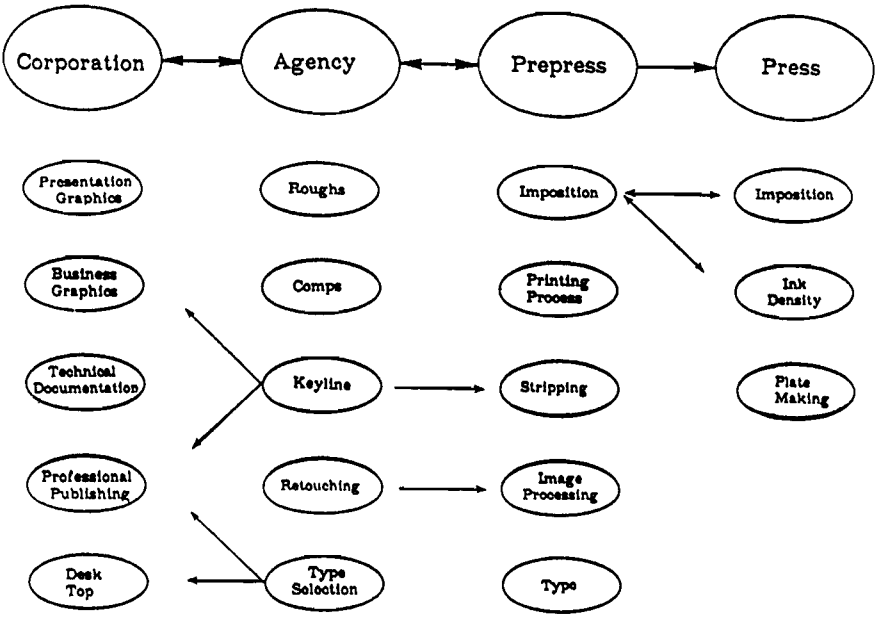

Figure 6: Changing Capabilities

As this pressure increases we have two diverse groups (products as well as standards activities) that require coordination (*Figure 7*).

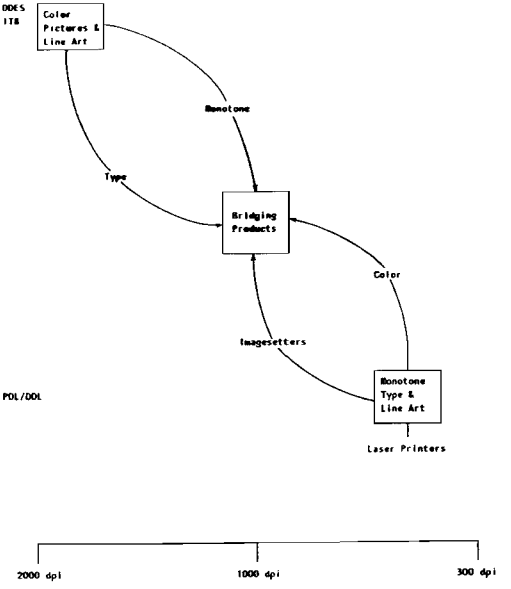

Figure 7: Diverse Groups for Text, Graphics and Color Images

The first group comes from the Color Electronic Prepress Systems (CEPS) vendors and users, and started out as color image processing systems for high quality printing. The second group comes from the word processing environment (the so called "Desktop Publishing" world). In between these two are high end typesetters, slidemakers, etc. These products form a base that will need to take in page description language (PDLs) and/or document description language (DDLs) files, and then output DDES files. For color this would seem to logically infer that an intermediate color space, such as a version of the CIE LAB spaces, be used in these "bridging" products.

Footnotes

[1] *Digital Data Exchange Standards (DDES) and ANSI's Image Technology Committee (IT8), A Status Report,* Patrice M. Dunn, Dunn Technology Inc., **1987 TAGA Proceedings,** pp. 132 - 144.

[2] *Digital Data Exchange Specification (DDES) UEFOO Format,* **The Dunn Report on Electronic Publishing & Prepress Systems,** Vol. IV, No. 6, 1986, pp. 1 - 16