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Making sense of digital graphics' alphabet soup

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It's a hazard of my line of work that occasionally I get into conversations like this one:

Me: "So, Karyn, how's it going?"

My friend and colleague: "Great. Listen, I'm sorry to talk shop during lunch, but I really need that 24-bit JPEG you were going to send me."

Me: "I was going to take a 10 compression and optimize it down to 96 dpi. Will that work?"

Karyn: "Sure. I want to use the file on my Web site, so I'll need a version crunched down to an 8-bit GIF…"

At this point we stopped. We were at lunch with a group of friends, and simultaneously we both became aware that everyone else at the table was listening to us — and, as far as they were concerned, we might as well have been speaking Swahili.

In the world of presentation graphics, the terms associated with file formats and image types fly fast and furious, with more being added all the time. To outsiders, or even to the professional presenter who only occasionally dips into the development field, it all sounds like a strange alphabet soup of acronyms and abbreviations. If you could use some translation, grab your scissors and clip this month's column. Here goes:

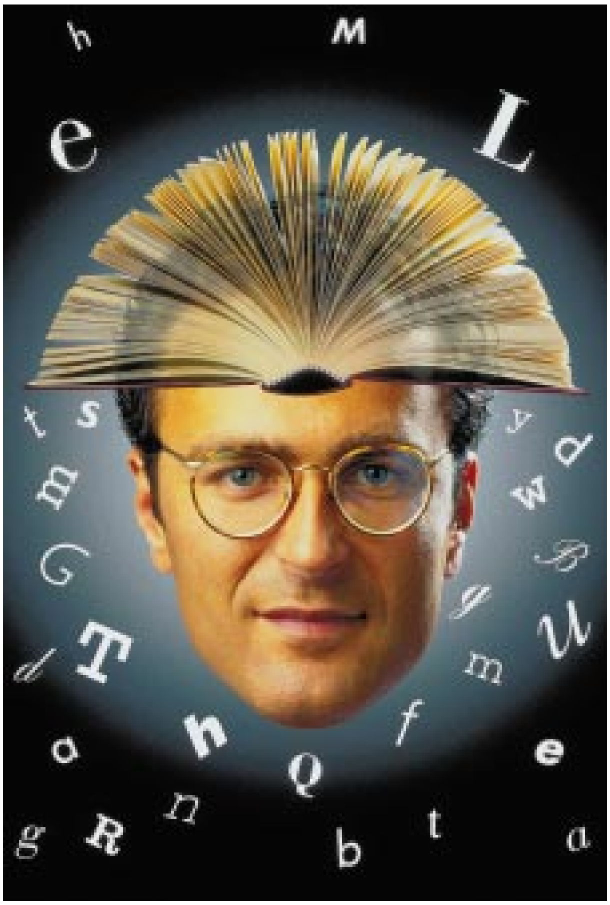

Image types

When you tackle computer graphics, the first thing you need to understand is the type of file you're working with. You'll find two types of images, determined by the image's nature and how it's created. Understanding the file type lets you know what tools you can use to manipulate the artwork — and how far you can press the manipulation before you trash the image.

Vector-based graphics. The most commonly found image in today's presentation software is vector-based file artwork. When you select a PowerPoint drawing tool (LINE, CIRCLE, BOX, AUTO SHAPES), you are creating a manufactured object. This means that as soon as you anchor the starting point, your operating system's object-description language references the shape, anchors the point, and, in the case of a box, creates an object that has equal lengths on opposite sides. When you release your mouse, Windows (or the Macintosh operating system) knows that this is where your object ends, and it creates that pre-defined shape to fill the parameters you've just created. Charts and most clip art are also vector-based artwork, so all are easily scalable.

There are some real benefits to working with a vector-based image. First, its file size is small, because what it really represents is a simple mathematical equation the operating system uses to recreate the object. Second, vector artwork can be easily resized and moved between slides. Third, you can use the UNGROUP and REGROUP commands to edit a graphic's individual points or vertices. In more complex images, such as maps, this helps you smooth out the artwork's irregular portions. (More-abstract shapes can be edited by right-mouse-clicking on the object and selecting EDIT POINTS. This shows the individual points that make up the shape; holding down the SHIFT key while you click will add points, and holding down CONTROL as you click will remove them.) Fourth, changing color on vector artwork is a piece of cake. It's easiest to use the standard LINE COLOR and FILL COLOR menus for this, but remember that grouped artwork needs to be ungrouped

before you can alter colors.

How do you tell if someone is sending you one of these images? Check the file's three-letter extension, which should indicate its format. File formats for vector-based images can include: *WMF*, or Windows metafile, the generic Windows-based interchange format that's easy to import; *CGM*, or computer-graphic metafile, which is less common than it used to be; and a variety of *proprietary formats* viewable only with vendor-specific viewers for clip art on CDs.

Bitmapped graphics. The second object type you will no doubt encounter is a bitmapped image, sometimes called a raster image. These images are created from thousands (or more) pixels, stacked by column and row. Individually, each pixel is a single dot of color, but when you zoom out and take in the big picture, all of them make up a complete image. Scanned photos and screen captures are bitmap images, with each pixel assigned a unique color value. How wide a range of colors you have available, the "color depth," is determined when you scan the image. An 8-bit color scan means that any pixel can have any one of 256 unique color values, which sounds good until you compare it with a 24-bit scanned file — in which a pixel can have any one of 16.8 *million* color options. With more color options, your final image is more photo-realistic, with smooth gradients, subtle variations and bright colors. Unfortunately, it also takes up significantly more file space. For that reason, you might decide that a logo looks fine at 8 bits, but a photo needs to be scanned at 24-bit color. (Not sure? Do a test and compare the results onscreen.)

With tens of thousands of pixels having millions of color options, a bitmapped file gets large fast. It's not unusual for a 300-dpi image scanned at 24-bit color to be between five and 10 megabytes or more in size — known to network administrators (who hate them) as a "brick." So if you know where the image will ultimately be used, you can scan accordingly.

Here's a brief primer on roughly how many dpi certain applications require:

Web-site graphics
72 dpi

Electronic presentations
72-96 dpi

35mm slides (4,000 lines of resolution)
200-300 dpi

Desktop printer, overheads, prints
300 dpi

Desktop publishing
300-600 dpi

Image archiving
up to 1,200 dpi

(The term *dpi*, incidentally, is more of a reference point than a truly useful number. This specification reflects scanning's roots in desktop publishing, when — you remember — we first defined an image's printed quality by the number of dots per inch our printer could lay down on paper. The more dots, the higher the quality.)

Modifying bitmapped images requires image-editing software (for instance, Adobe Photoshop, Microsoft PhotoDraw or Ulead PhotoImpact) so you can manipulate the pixels. Although most presentation templates available today are vector-based (you can recognize them by their hard edges or gradient fills), we're starting to see more bitmapped backgrounds and textures that provide more elegant and softer-edged alternatives. If you're designing a template from scratch in an application such as Photoshop, you can airbrush in subtle background elements, create soft drop shadows, merge and subdue picture elements — your only limitation is the size of your imagination.

Bitmapped file formats include: *PCX*, the generic Windows-application format, originally PC Paintbrush (4-, 8- or 24-bit); *BMP*, the standard Windows bitmap storage (1-, 4-, 8- or 24-bit); *JPEG* (or JPG), for Joint Photographic Experts Group, a 24-bit color file with superior compression characteristics (because it's supported by current presentation software, it's good advice to use this whenever possible); *GIF*, graphic interchange format, an 8-bit color format (lower quality and with a smaller file size than JPG) commonly used for Web sites; *PNG*, portable network graphics, a higher-quality alternative to GIF whose larger file sizes can store up to 48 bits of information; and *TIFF*, tag image file format, a 24-bit format that moves well across different platforms and formats.

Color depth and file size

To better define the "color depth" issue, here are three mathematical formulas to show how we come to the number of colors and the ultimate file size of an image. All three involve division by 8 because 1 byte equals 8 bits, which means that an 8-bit image has 1 byte of information per pixel. (We've used a quarter-screen image size of 320 x 240 pixels.)

color depth and file size

4-bit color image

$$\frac{320 \text{ pixels} \times 240 \text{ pixels} \times 4 \text{ bits (16 colors)}}{8} = \textbf{38.4K}$$

8-bit color image

$$\frac{320 \text{ pixels} \times 240 \text{ pixels} \times 8 \text{ bits (256 colors)}}{8} = \textbf{76.8K}$$

24-bit color image

$$\frac{320 \text{ pixels} \times 240 \text{ pixels} \times 24 \text{ bits (16.8 million colors)}}{8} = \textbf{230.4K}$$

Breaking the code

The graphics business has become a wide sea of esoteric lingo. Perhaps we'll never all share a comprehensive vocabulary, but it's no disgrace to have a pocket resource close by (such as this column) to help break the code.

After all, it isn't asking for help that gets you in trouble — it's not having the courage to ask.

How do you say, "Where is the bathroom?" in Swahili? P