

Designing
and optimizing
PDF files for the
World-Wide Web

Have Your Cake and Eat It, Too

By Tamis Nordling

IMAGINE GETTING LOST IN A GIANT MALL THAT CONTAINS NOTHING but restaurants, all of which serve food that looks and smells more or less the same. Even if you were hungry at first, you'd probably find your appetite gradually dissipating.

Sometimes browsing the World-Wide Web can feel a bit like that. Many sites look and feel roughly the same, due in part to the limitations of the HTML (hypertext markup language) in which they're designed. So when you *do* stumble across a different-looking, attractive site with interesting content, it can feel as if you're sitting down to a gourmet meal.

One of the best ways to serve up an appetizing Web site is by using Adobe PDF (portable document format) files. With PDF, you have far more design control and flexibility than you do with

HTML, so you can create documents that really stand out. But if you're just getting started with PDF, be careful. Its flexibility can be your downfall—if you're not judicious about how you use the capabilities of PDF, you'll end up with documents that are uncomfortable to read on screen or too bloated for people to download easily.

On the other hand, if you're savvy about PDF, you can have your cake and eat it, too—you can design documents that are both a rich visual treat *and* small enough to facilitate easy downloading. In this article, we'll explain how to do that.

Adobe Acrobat is a family of software products that allows you

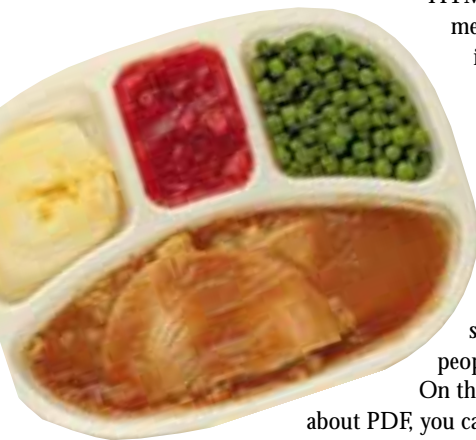
to take a document you've created in virtually any program and convert it to a PDF file, which can be viewed with its formatting intact on a wide variety of computer platforms. This article assumes you're already familiar with Acrobat and PDF. If you're not, see Olav Martin Kvern's "On the High Wire," pages 57–62 in the March/April 1995 issue of *Adobe Magazine*. If you're new to the World-Wide Web, see Glenn Fleishman's "Weaving the Perfect Web," pages 69–73 in the September/October 1995 issue of *Adobe Magazine*. Also, there's lots of Acrobat information on Adobe's World-Wide Web site at <http://www.adobe.com/>.

Before you get started

Before you create a PDF file, you should be clear on *why* you want to use PDF, because that will play an important role in determining how you should approach the design and production process. If you're primarily interested in using PDF for electronic reprints of material originally designed for paper, you'll need to make sure your documents will work well in that format—see the tips in the sidebar "Compromising between paper and screen," on page 58.

On the other hand, if you're designing something from scratch and want to use PDF because of the portability, design control, and flexibility it offers, ask yourself whether you want people to read your document on screen or to print it out in order to read it. Here's why:

- ▶ Designing your document for on-screen reading will allow you to take greater advantage of color and interactive, nonlinear navigational structures—it can make your document more interesting and engaging, but . . .
- ▶ Designing your document so that it's easier to read once it's printed out may be more appropriate if you need to present lots of highly complex material, or if you're designing something



that needs to be published traditionally (on paper, that is), as well as in PDF. If you decide you want to design your document for on-screen reading, see the next section for in-depth advice. If you think your material is better suited to a format designed to be printed for reading, see the tips in the sidebar "Compromising between paper and screen," on page 58.



Serving suggestions for the screen

Designing for the screen is quite different from designing for printed output. Computer monitors use a much lower resolution than printing devices do, have display dimensions that don't match standard paper sizes, and use a different color model (RGB) from the one that printing presses and most color printers use (CMYK). And it's fundamentally harder to read from a computer monitor than it is to read something on paper—partly because of the resolution differences, and partly because monitors flicker and project much more light than paper reflects. Do your best to make your on-screen designs engaging and friendly to the eye. Here are some tips that can help:

Think small. If you want your document to look attractive and be easy to read for as many people as possible, you'll need to design for the least sophisti-

Illustrator, or another application that lets you control zoom factors, you should spend most of your time viewing your document at "actual" size, or 100 percent of its printed size. This will help ensure that you make layout and font choices that make your document easy to read and navigate on screen. To check how well your design will work on a 256-color monitor, either set your monitor to display in 256 colors while you're designing, or periodically change your display to 256 colors to see how well your colors will dither on a 256-color display.

Choose page dimensions appropriate for the screen.

To ensure that your entire page will display at its full size on a 13-inch monitor, follow these guidelines:

- ▶ If you want your readers to view the PDF document with Acrobat's menu, toolbar, and scroll bars also displaying (which is Acrobat's default), the maximum size you can use is about 8.5 by 5.25 inches.
- ▶ If you want to set the PDF document to run in "Full Screen" mode (so that your document displays by itself with a black or colored background and none of Acrobat's menus and toolbars), the maximum page size that will fit on a 13-inch monitor without being reduced is 8.89 by 6.67 inches (PageMaker 6.0 has a default page size with these dimensions—it's called "640 x 480 13" monitor"). See the Acrobat Exchange help file for more information on Acrobat's "Full Screen" mode.

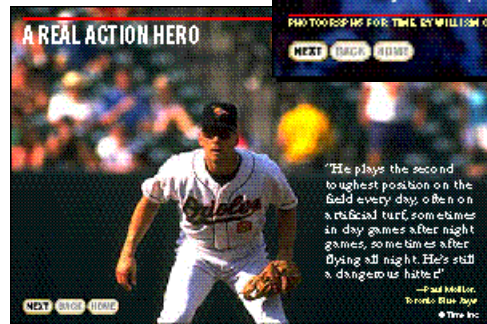
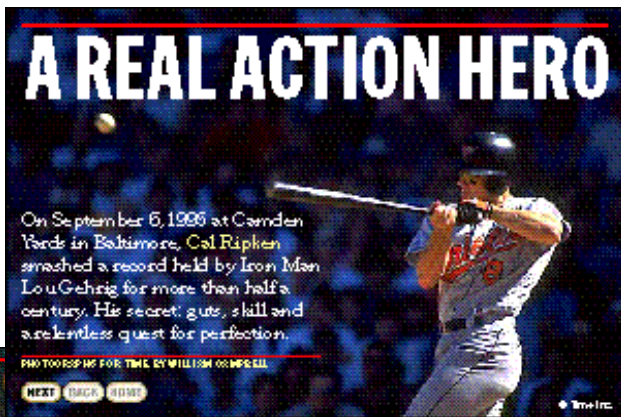
Specify type for on-screen readability. Because reading type on screen is inherently more difficult than reading it on paper, you'll need to be careful about the typefaces you choose, especially those you use for body copy. Avoid making extensive use of typefaces that are hard to read even on paper—such typefaces include script and ornate italics. Also, stay away from typographic and layout choices that can compromise readability—for instance, avoid using all caps, and avoid setting your type on complicated or high-contrast, eye-straining backgrounds. Try to select fonts that look good and are readable specifically at low resolution.

Typefaces that have a very high contrast

between thick and thin strokes may not work well. Even some very simple, unadorned typefaces (which you might think would work well at low resolutions) can look poor on screen, because their smooth, gentle curves can look especially jagged. In fact, it's hard to tell exactly which fonts will look best on screen without testing them, so try to view your type at the size and resolution at which your readers will see it.

Also, keep an eye out for word- and letter-spacing problems, especially if certain words or lines look tight—this will hinder readability even more than it does on paper.

The images below and at right are pages from a photo-essay PDF on Cal Ripken, Jr. The PDF was designed and produced by Janet Waegel of Time, Inc. for TIME World Wide, the online edition of TIME magazine, located at <http://pathfinder.com/time/>. The 13-page photo essay is posted in two parts, each around 200 KB. It's designed on 7.5-by-5-inch pages that look good and are easy to read even on a 13-inch monitor.



cated type of monitor a significant portion of your audience will have. In most cases, that'll be a 13-inch monitor running at a resolution of 640 by 480 pixels and 256 colors.

One way to accomplish your goal is to design your documents on a 13-inch monitor (if you don't have one or don't want to use it, be extra careful to choose page sizes that'll work on smaller monitors). If you design using PageMaker,

Optimizing PDF files with the Distiller's job options

If you want PDF files that are as lean as possible, you'll need to know your way around Acrobat Distiller's "Job Options" dialog box. Here's an overview of how to use these options to get the smallest PDFs possible.

A "Compress (LZW) text and graphics."

Leave this on. This makes Acrobat Distiller compress everything in your document (except bitmap graphics) with LZW, a nonlossy compression scheme (a compression scheme that doesn't remove or alter any data—just compresses it).

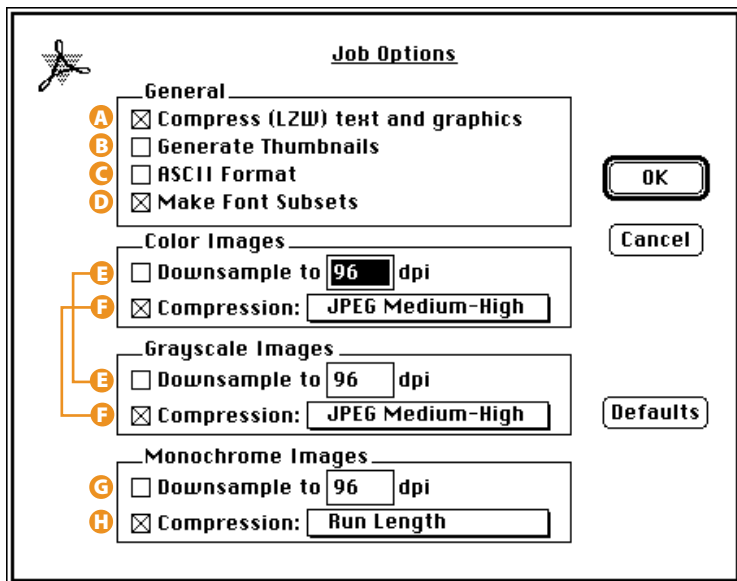
B "Generate Thumbnails." Keep this off. It creates miniature pictures of your pages that Acrobat Reader and Exchange can display in a vertical row to the left of their main display areas. These pictures act like a visual table of contents, and though they can be handy, they increase file size.

C "ASCII Format." Keep this off. Checking it allows Acrobat to save your file in ASCII format instead of 8-bit binary format (binary is about 20 percent more compact than ASCII).

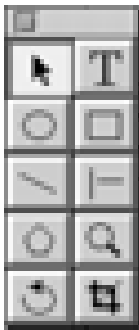
D "Make Font Subsets." Leave this on if you're embedding fonts. This allows Acrobat to embed just the characters you use from each font if you use fewer than 10 percent of the font's characters.

E "Downsample to XX dpi" for color and grayscale images. If you want Acrobat to automatically downsample color and grayscale images, select this option—it establishes the minimum resolution to which Acrobat will downsample your images. For the most compact bitmaps that will still look good on the widest variety of computer monitors (unless your reader zooms in on the images), enter a value of 96 dpi, which is the resolution of most DOS and Windows monitors—most UNIX users have monitors that run at 92 dpi or 96 dpi, and Macintosh monitors generally use 72 dpi (a 96-dpi image will look fine on a 72-dpi screen, since the image will contain just a little more data than that monitor requires).

Acrobat Distiller's automatic downsampling feature will downsample your images by progressively dividing their resolution by whole numbers, going as far as it can with-



out going below the minimum resolution you've set. (For instance, it can downsample a 300-dpi image to 150 dpi, 100 dpi, 75 dpi, and so forth. So if you have a 300-dpi image and set the Distiller's downsampling option to 96 dpi, Acrobat would downsample your 300-dpi image to 100 dpi, since dividing its resolution by 3 would put the image below the minimum resolution you'd set at 96 dpi.) If you want to make sure all your images compress as much as possible, or want to use different, arbitrary resolutions for your images, you'll need to downsample them individually in Photoshop or another image-editing



application. Be sure not to downsample screen captures (either manually or automatically)—doing so will make them look blurry (see sample above).

F "Compression" options for color and grayscale images. For maximum compression of color and grayscale images, use the highest level of JPEG you can get away with—in other words, the highest level that doesn't change the look of your images to

an unacceptable degree. JPEG is a lossy compression format (one that removes data from your image) that's designed to work best with natural, photographic images.

Do not use JPEG with synthetic images, such as screen captures, that have large areas of solid color or sharp color changes—doing so will make such images look blurry. LZW works better for such images. So what do you do if you have a combination of natural and synthetic color or grayscale images? If you have Acrobat Distiller 2.1, you won't have a problem—just set your compression options to JPEG and the Distiller will, by default, recognize images for which JPEG would be inappropriate and use LZW for such images instead.

G "Downsample to XX dpi" for monochrome images. The resolution of monochrome bitmap images needs to be at least as high as that of the monitor—higher if your readers will be zooming in to view the images at a larger size.

H "Compression" options for monochrome images. All these options are nonlossy. For information that can help you decide which compression scheme will work best for your images, see the PDF help file that comes with Acrobat Distiller.

Keeping PDF files light and trim

No matter how good your PDF documents look, some readers won't bother with them if they're too big to download easily. With the current technology, readers have to download an entire PDF file before they can read any of it, so for now you need to watch the total size of each PDF file. Sometime in the future, however, this won't be much of an issue—the next version of Acrobat (code-named "Amber") will allow readers to download and view just one page at a time. That'll mean you can publish much larger PDF files as long as each PDF page doesn't get too big.

Compromising between paper and screen

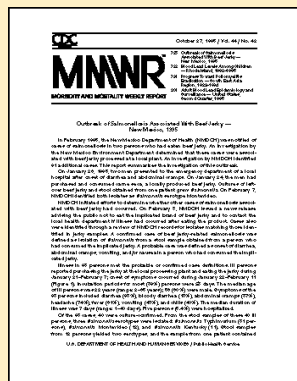
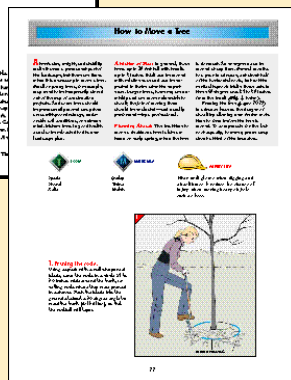
If you need to adapt print material to PDF or you want to optimize a PDF file's design for printed output, there are a number of things you can do to ensure that those files also work well on screen.

- ▶ Try adding a screen-sized and -shaped "cover" page to print-based materials you're adapting to PDF. This cover page is a great place to explain that the document will be easiest to read once printed, and you can use it to list trademark and copyright details, colophon information, and so forth.
- ▶ If you want a multicolumn, letter-sized document to be reasonably easy to read on screen, try using Acrobat Exchange to add article threading, to make the text more navigable (see Acrobat's help files for more information).



Here are two examples of 8.5-by-11-inch files that work well on screen. Above are two pages (not shown to scale) from a PDF file adapted from Time Life's "Home Repair and Improvement" series. It features a screen-sized cover page; other pages are letter sized. This document and other PDFs on landscaping and gardening can be found at Time Life's "Virtual Garden" Web site, URL <http://pathfinder.com/vg>.

At right is a page from a PDF version of the Center for Disease Control's Mortality and Morbidity Weekly Report (available from <http://www.cdc.gov/>). This 20-page, 233-K document uses a single column of text that fits well on a 13-inch monitor.



How big is too big? It depends on how fast your reader's connection is, and how motivated he or she is to read your document.

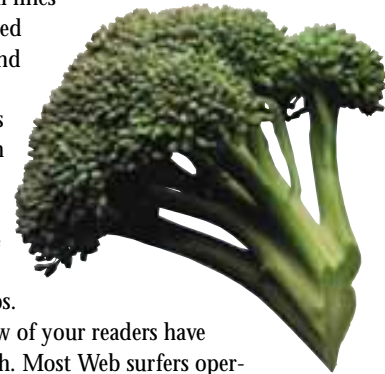
Connection speeds and download times. There are several ways to hook up to the World-Wide Web and other online services. In most parts of the country, you can pay to have special lines installed—ISDN (integrated services digital network) and T1, for instance. ISDN offers speeds of 64,000 bps (bits per second), although new standards should allow you to get ISDN's maximum connection rate of twice that. T1 offers speeds up to 1,500,000 bps.

Chances are that very few of your readers have access to such lines, though. Most Web surfers operate over POTS (plain old telephone service) lines that offer a *maximum* speed of around 28,800 bps—a speed that few POTS users will get, even if they have 28,800-bps modems. Only a small percentage of the phone lines across the country actually support 28,800 bps. In addition, setup problems and static on phone lines can keep modems from making connections at their top speeds. And, of course, many Web surfers don't have 28,800-bps modems—14,400-bps and 9600-bps models, for example, are also commonly used to access the Web.

What does this mean for download times? Let's look at some examples. Over a 28,800-bps, 14,400-bps, 9600-bps, and 2400-bps connection, a 1-mega-byte file (over 8 million bits) will take, respectively, almost 5 minutes, almost 10 minutes, about 14 1/2 minutes, and almost an hour to download. At the same connection speeds, a 300-KB file will take about 1 1/2 minutes, almost 3 minutes, about 4 1/4 minutes, and about 17 minutes to download. Actual download times may be slower due to a variety of reasons, or may sometimes be faster—modems that support data-compression standards can speed the transfer of files with redundant text or image data, but this won't significantly affect precompressed files (including PDF files and GIF, compressed TIFF, and JPEG images). So when you're distributing PDF files, try to keep them around 300 KB or smaller—this should keep downloads manageable for almost everyone except those connected at slower than 9600 bps.

Omit needless bytes. Fortunately, with the right know-how, you can keep your PDF files to a very manageable size. (Please note: This section focuses on techniques to use with Acrobat Distiller, which offers slightly more sophisticated options than the Acrobat PDFWriter does. Distiller ships free with PageMaker 6.0, and is also part of the Acrobat Pro package.)

Often what's responsible for large PDF files are big, complex graphics—especially ones that haven't been



simplified, downsampled, or compressed appropriately. For information on eliminating image bloat, see “Optimizing PDF files with the Distiller’s job options” on page 57. Here are a few more things you can do to cut down on PDF file sizes:

- ▶ If you use a font extensively and it isn’t highly decorative, consider not embedding it (this can be an especially good idea for body copy). For many fonts, Acrobat can create simulations that look good and are easy to read on screen.
- ▶ If you alter your PDF file in Acrobat, be sure to use the “Save As” command to save it—doing so will rewrite the file so it’s as compact as possible (instead of appending it with your changes).
- ▶ If your PDF file is still too big even after you’ve optimized it, consider breaking it up into more than one file. If those files will be distributed via the Web, you can use Weblink (a Plug-in that comes with Acrobat 2.1) to link them to each other. See the PDF help file that comes with Acrobat Exchange 2.1 for more information.

If you do need to distribute a large PDF (or any large file) over the Web, try to list its file size so people with slow connections will know before they download the file that it’ll take a while. Also, consider providing a brief abstract of the PDF’s contents—that’ll help your readers decide which files to download.

Save room for dessert

Learning how to design and optimize PDFs for the World-Wide Web might seem somewhat complicated, at least at first—after all, many of us who are used to designing for print usually don’t worry *that* much about the exact resolution of each image we use, how well all our colors will work under different viewing conditions, and so forth. Service providers do a lot of that worrying for us. But if you’re publishing with PDF, you’re your own service provider—you’re the designer, production manager, color house, *and* printer.

And that’s OK, because PDF can be much more forgiving than a four-color printing press. PDF files are easier to change, cheaper and faster to distribute, and can be more colorful, engaging, and easy to use than printed material. So make time to experiment with different design approaches, do your homework on PDF compression techniques, and pretty soon making great-looking, trim PDF files will seem like a piece of cake. ▶



Tamis Nordling is Adobe Magazine’s technical editor.



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