**Font Technologies and Formats**  
Font technologies can be classified as falling into one of two broad categories:  
**Bitmap Fonts** The simplest type of font format is the *bitmap font*, which represents fonts  
much like bitmap graphics in which individual pixels in an array are either active or  
inactive. Bitmap fonts are fairly easy to manipulate and display from a programming  
perspective, which makes them good for low-powered computers. The problem is that each  
font must be optimized for display at a particular resolution. For instance, a font that’s 20  
pixels high will appear one size on the screen (typically 72 to 100 dots per inch, or dpi)  
but will be much smaller when printed (typically at 300 to 1200 dpi). Similarly, you need  
multiple files to display a single font at multiple sizes (such as 9 point versus 12 point). This  
means that a single font, such as Times, requires potentially dozens of individual files for  
display at different sizes and on different display devices. If you lack the correct font file,  
the result will be an ugly scaled display.  
**Outline Fonts** Most modern fonts are distributed as *outline fonts* (aka *scalable fonts*). This  
type of format represents each character as a series of lines and curves in a high-resolution  
matrix. The computer can scale this representation to any font size or for any display resolution, enabling a single font file to handle every possible use of the font. The main problem  
with outline fonts is that this scaling operation is imperfect; scalable fonts often look slightly  
worse than bitmap fonts, particularly at small sizes. Scaling and displaying the fonts also  
takes more CPU time than displaying a bitmap font. This factor used to be important, but  
on modern CPUs it’s not much of an issue.  
Both bitmap and outline fonts come in several different formats. X ships with a number  
of basic bitmap and outline fonts, and you’re unlikely to need to deal explicitly with bitmap  
fonts or their formats, so we don’t describe them in any detail. Outline fonts are another  
matter, though. The two main formats are Adobe’s *PostScript Type 1* (Type 1 for short)  
and the *TrueType* font standard, developed by both Apple and Microsoft. Fonts available  
on the Internet and on commercial font CDs come in one or both of these formats.  
XFree86 3.3.6 and earlier supported Type 1 fonts but not TrueType fonts. XFree86 4.*x*  
and X.org-X11 support both Type 1 and TrueType fonts.