Apache FOP: Fonts

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1 Summary

The following table summarizes the font capabilities of the various FOP renderers:

Renderer	Base-14	AWT/OS	Custom	Custom Embedding
PDF	yes	no	yes	yes
PostScript	yes	no	yes	yes
PCL	yes (modified)	yes (painted as bitmaps)	yes (painted as bitmaps)	no
AFP	no	no	yes	yes
Java2D/AWT/Bitmap	if available from OS	yes	yes	n/a (display only)
Print	if available from OS	yes	yes	controlled by OS printer driver
RTF	n/a (font metrics not needed)	n/a	n/a	n/a
TXT	yes (used for layout but not for output)	no	yes (used for layout but not for output)	no
XML	yes	no	yes	n/a

2 Base-14 Fonts

The Adobe PostScript and PDF Specification specify a set of 14 fonts that must be available to every PostScript interpreter and PDF reader: Helvetica (normal, bold, italic, bold italic), Times (normal, bold, italic, bold italic), Courier (normal, bold, italic, bold italic), Symbol and ZapfDingbats.

Please note that recent versions of Adobe Acrobat Reader replace "Helvetica" with "Arial" and "Times" with "Times New Roman" internally. GhostScript replaces "Helvetica" with "Nimbus Sans L" and "Times" with "Nimbus Roman No9 L". Other document viewers may do similar font substitutions. If you need to make sure that there are no such substitutions, you need to specify an explicit font and embed it in the target document.

3 Missing Fonts

When FOP does not have a specific font at its disposal (because it's not installed in the operating system or set up in FOP's configuration), the font is replaced with "any". "any" is internally mapped to the Base-14 font "Times" (see above).

4 Java2D/AWT/Operating System Fonts

The Java2D family of renderers (Java2D, AWT, Print, TIFF, PNG), use the Java AWT subsystem for font metric information. Through operating system registration, the AWT subsystem knows what fonts are available on the system, and the font metrics for each one.

When working with one of these output formats and you're missing a font, just install it in your operating system and they should be available for these renderers. Please note that this is not true for other output formats such as PDF or PostScript.

5 Custom Fonts

Support for custom fonts is highly output format dependent (see above table). This section shows how to add Type 1 and TrueType fonts to the PDF, PostScript and Java2D-based renderers. Other renderers (like AFP) support other font formats. Details in this case can be found on the page about output formats.

Prior to FOP version 0.94, it was always necessary to create an XML font metrics file if you wanted to add a custom font. This unconvenient step has been removed and in addition to that, FOP supports auto-registration of fonts, i.e. FOP can find fonts installed in your operating system or can scan user-specified directories for fonts. Font registration via XML font metrics file is still supported and is still necessary if you want to use a TrueType Collection (*.ttc). Direct support for TrueType collections may be added later. Furthermore, the XML font metrics files are still required if you don't want to embed, but only reference a font.

Basic information about fonts can be found at:

- Adobe font types
- Adobe Font Technote

6 Basic font configuration

If you want FOP to use custom fonts, you need to tell it where to find them. This is done in the configuration file and once per renderer (because each output format is a little different). In the basic form, you can either tell FOP to find your operating system fonts or you can specify directories that it will search for support fonts. These fonts will then automatically be registered.

```
<fonts>
  <!-- register all the fonts found in a directory -->
  <directory>C:\MyFonts1</directory>

  <!-- register all the fonts found in a directory
       and all of its sub directories (use with care) -->
  <directory recursive="true">C:\MyFonts2</directory>

  <!-- automatically detect operating system installed fonts -->
  <auto-detect/>
</fonts>
```

Note:

Review the documentation for FOP Configuration for instructions on making the FOP configuration available to FOP when it runs. Otherwise, FOP has no way of finding your custom font information. It is currently not possible to easily configure fonts from Java code.

7 Advanced font configuration

The instructions found above should be sufficient for most users. Below are some additional instructions in case the basic font configuration doesn't lead to the desired results.

7.1 Type 1 Font Metrics

FOP includes PFMReader, which reads the PFM file that normally comes with a Type 1 font, and generates an appropriate font metrics file for it. To use it, run the class org.apache.fop.fonts.apps.PFMReader:

Windows:

```
java -cp build\fop.jar;lib\avalon-framework.jar;lib\commons-logging.jar;lib\commons-io.jar
          org.apache.fop.fonts.apps.PFMReader [options] pfm-file xml-file
```

Unix:

```
java -cp build/fop.jar:lib/avalon-framework.jar:lib/commons-logging.jar:lib/commons-io.jar
          org.apache.fop.fonts.apps.PFMReader [options] pfm-file xml-file
```

PFMReader [options]:

- **-fn <fontname>** By default, FOP uses the fontname from the .pfm file when embedding the font. Use the "-fn" option to override this name with one you have chosen. This may be useful in some cases to ensure that applications using the output document (Acrobat Reader for example) use the embedded font instead of a local font with the same name.

> Note:
>
> The classpath in the above example has been simplified for readability. You will have to adjust the classpath to the names of the actual JAR files in the lib directory. xml-apis.jar, xercesImpl.jar, xalan.jar and serializer.jar are not necessary for JDK version 1.4 or later.

> Note:
>
> The tool will construct some values (FontBBox, StemV and ItalicAngle) based on assumptions and calculations which are only an approximation to the real values. FontBBox and Italic Angle can be found in the human-readable part of the PFB file or in the AFM file. The PFMReader tool does not yet interpret PFB or AFM files, so if you want to be correct, you may have to adjust the values in the XML file manually. The constructed values however appear to have no visible influence.

7.2 TrueType Font Metrics

FOP includes TTFReader, which reads the TTF file and generates an appropriate font metrics file for it. Use it in a similar manner to PFMReader. For example, to create such a metrics file in Windows from the TrueType font at c:\myfonts\cmr10.ttf:

```
java -cp build\fop.jar;lib\avalon-framework.jar;lib\commons-logging.jar;lib\commons-io.jar
          org.apache.fop.fonts.apps.TTFReader [options]
          C:\myfonts\cmr10.ttf ttfcm.xml
```

TTFReader [options]:

- **-d <DEBUG | INFO >** Sets the debug level (default is INFO).
- **-fn <fontname>** Same as for PFMReader.

- **-ttcname <fontname>** If you're reading data from a TrueType Collection (.ttc file) you must specify which font from the collection you will read metrics from. If you read from a .ttc file without this option, the fontnames will be listed for you.
- **-enc ansi** Creates a WinAnsi-encoded font metrics file. Without this option, a CID-keyed font metrics file is created. The table below summarizes the differences between these two encoding options as currently used within FOP. Please note that this information only applies to TrueType fonts and TrueType collections:

Issue	WinAnsi	CID-keyed
Usable Character Set	Limited to WinAnsi character set, which is roughly equivalent to iso-8889-1.	Limited only by the characters in the font itself.
Embedding the Font	Optional.	Mandatory. Not embedding the font produces invalid PDF documents.

Warning:

You may experience failures with certain TrueType fonts, especially if they don't contain the so-called Unicode "cmap" table. TTFReader can currently not deal with font like this.

7.3 TrueType Collections Font Metrics

TrueType collections (.ttc files) contain more than one font. To create metrics files for these fonts, you must specify which font in the collection should be generated, by using the "-ttcname" option with the TTFReader.

To get a list of the fonts in a collection, just start the TTFReader as if it were a normal TrueType file (without the -ttcname option). It will display all of the font names and exit with an Exception.

Here is an example of generating a metrics file for a .ttc file:

```
java -cp build\fop.jar;lib\avalon-framework.jar;lib\commons-logging.jar;lib\commons-io.jar
          org.apache.fop.fonts.apps.TTFReader -ttcname "MS Mincho"
          msmincho.ttc msminch.xml
```

7.4 Register Fonts with FOP

You must tell FOP how to find and use the font metrics files by registering them in the FOP Configuration. Add entries for your custom fonts, regardless of font type, to the configuration file in a manner similar to the following:

```
<fonts>
  <!-- register a particular font -->
  <font metrics-url="file:///C:/myfonts/FTL_____.xml" kerning="yes"
      embed-url="file:///C:/myfonts/FTL_____.pfb">
     <font-triplet name="FrutigerLight" style="normal" weight="normal"/>
  </font>

  <!-- register all the fonts found in a directory -->
  <directory>C:\MyFonts1</directory>

  <!-- register all the fonts found in a directory
       and all of its sub directories (use with care) -->
```

```
  <directory recursive="true">C:\MyFonts2</directory>

  <!-- automatically detect operating system installed fonts -->
  <auto-detect/>
</fonts>
```

- URLs are used to access the font metric and font files. Relative URLs are resolved relative to the font-base property (or base) if available. See FOP: Configuration for more information.
- The "metrics-url" attribute is generally not necessary except if you run into problems with certain fonts.
- Either an "embed-url" or a "metrics-url" must be specified for font tag configurations.
- The font "kerning" attribute is optional. Default is "true".
- If embedding is off (i.e. embed-url is not set), the output will position the text correctly (from the metrics file), but it will not be displayed or printed correctly unless the viewer has the applicable font available to their local system.
- When setting the "embed-url" attribute for Type 1 fonts, be sure to specify the PFB (actual font data), not PFM (font metrics) file that you used to generate the XML font metrics file.
- The fonts "directory" tag can be used to register fonts contained within a single or list of directory paths. The "recursive" attribute can be specified to recursively add fonts from all sub directories.
- The fonts "auto-detect" tag can be used to automatically register fonts that are found to be installed on the native operating system.
- Fonts registered with "font" tag configurations override fonts found by means of "directory" tag definitions.
- Fonts found as a result of a "directory" tag configuration override fonts found as a result of the "auto-detect" tag being specified.
- If relative URLs are specified, they are evaluated relative to the value of the "font-base" setting. If there is no "font-base" setting, the fonts are evaluated relative to the base directory.

7.5 Auto-Detect and auto-embedd feature

When the "auto-detect" flag is set in the configuration, FOP will automatically search for fonts in the default paths for your operating system.

FOP will also auto-detect fonts which are available in the classpath, if they are described as "application/x-font" in the MANIFEST.MF file. For example, if your .jar file contains font/myfont.ttf:

```
Manifest-Version: 1.0

          Name: font/myfont.ttf
          Content-Type: application/x-font
```

This feature allows you to create JAR files containing fonts. The JAR files can be added to fop by providem them in the classpath, e.g. copying them into the lib/ directory.

7.6 Embedding

> **Note:**
> The PostScript renderer does not yet support TrueType fonts, but can embed Type 1 fonts.

> **Note:**
> The font is simply embedded into the PDF file, it is not converted.

Font embedding is enabled in the userconfig.xml file and controlled by the embed-url attribute. If you don't specify the embed-url attribute the font will not be embedded, but will only be referenced.

> **Warning:**
> Omitting the embed-url attribute for CID-encoded TrueType fonts will currently produce invalid PDF files! If you create the XML font metric file using the "-enc ansi" option, you can omit the embed-url attribute for TrueType fonts but you're restricted to the WinAnsi character set.

When FOP embeds a font, it adds a prefix to the fontname to ensure that the name will not match the fontname of an installed font. This is helpful with older versions of Acrobat Reader that preferred installed fonts over embedded fonts.

When embedding PostScript fonts, the entire font is always embedded.

When embedding TrueType fonts (ttf) or TrueType Collections (ttc), a subset of the original font, containing only the glyphs used, is embedded in the output document.