

# The fontspec package

## Font selection for X<sub>Y</sub>LaTeX and LuaLaTeX

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<http://latex3.github.io/fontspec/>

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# File I

## fontspec.dtx

### 1 Package declaration

List all dtx files for running the ins file and typesetting the code.

```
1 <*dtx>
2 \gdef\FONTSPECDTX{
3   \DTX{fontspec.dtx}
4   \DTX{fontspec-code-load.dtx}
5   \DTX{fontspec-code-vars.dtx}
6   \DTX{fontspec-code-msg.dtx}
7   \DTX{fontspec-code-opening.dtx}
8   \DTX{fontspec-code-fontload.dtx}
9   \DTX{fontspec-code-interfaces.dtx}
10  \DTX{fontspec-code-user.dtx}
11  \DTX{fontspec-code-api.dtx}
12  \DTX{fontspec-code-internal.dtx}
13  \DTX{fontspec-code-opentype.dtx}
14  \DTX{fontspec-code-graphite.dtx}
15  \DTX{fontspec-code-keyval.dtx}
16  \DTX{fontspec-code-feat-opentype.dtx}
17  \DTX{fontspec-code-scripts.dtx}
18  \DTX{fontspec-code-lang.dtx}
19  \DTX{fontspec-code-feat-aat.dtx}
20  \DTX{fontspec-code-enc.dtx}
21  \DTX{fontspec-code-math.dtx}
22  \DTX{fontspec-code-closing.dtx}
23  \DTX{fontspec-code-xfss.dtx}
24 }
25 </dtx>
```

Now exit if we're using plain  $\TeX$ ; this would usually be the case when loading this file with `fontspec.ins`.

```
26 <*dtx>
27 \def\tmpa{plain}
28 \ifx\tmpa\fmtname\expandafter\endinput\fi
29 </dtx>
```

Metadata for documentation; the official title and authors of the package.

```
30 <*dtx>
31 \title{
32   The \textsf{fontspec} package\\
33   Font selection for \XeLaTeX\ and \LuaLaTeX
34 }
35 \author{
36   \textsc{Will Robertson}\\
37   With contributions by Khaled Hosny,\\
38   Philipp Gesang, Joseph Wright, and others.\\
39   \url{http://latex3.github.io/fontspec/}
```

```

40 }
41 </dtx>

```

Declare the package version and date for each of the .sty files generated. In addition, declare the version and date for this .dtx file.

```

42 <fontspec>\RequirePackage{xparse}
43 <fontspec & load>\ProvidesExplPackage{fontspec}%
44 <fontspec & XE>\ProvidesExplPackage{fontspec-xetex}%
45 <fontspec & LU>\ProvidesExplPackage{fontspec-luatex}%
46 *dtx)
47 \RequirePackage{xparse}
48 \ProvidesExplFile{fontspec.dtx}
49 </dtx>
50 *fontspec)
51 {2024/05/11}{2.9e}{Font selection for XeLaTeX and LuaLaTeX}
52 </fontspec>

```

Here the version and date are setup for typesetting the documentation.

```

53 *dtx)
54 \GetFileInfo{fontspec.dtx}
55 \date{\filedate \quad \fileversion}
56 </dtx>

```

## 1.1 Lua header

```

57 <lua>fontspec          = fontspec or {}
58 <lua>local fontspec   = fontspec
59 <lua>fontspec.module   = {
60 <lua>  name           = "fontspec",
61 <lua>  version        = "2.9e",
62 <lua>  date           = "2024/05/11",
63 <lua>  description    = "Font selection for XeLaTeX and LuaLaTeX",
64 <lua>  author         = "Khaled Hosny, Philipp Gesang, Will Robertson",
65 <lua>  copyright      = "Khaled Hosny, Philipp Gesang, Will Robertson",
66 <lua>  license        = "LPPL v1.3c"
67 <lua>}

```

## File II

# fontspec-code-load.dtx

## 1 The fontspec.sty loading file

Before we begin, for the rest of the package we use the `@@ expl3` module syntax with module name 'fontspec'.

```
1 <@@=fontspec>
```

The fontspec.sty file is simply set up to load the appropriate fontspec-xetex.sty or fontspec-luatex.sty file. This is performed by the following code.

```
2 <*load>
```

### Lua $\LaTeX$

```
3 \sys_if_engine_luatex:T
4 {
5   \RequirePackage{luaotfload}
6   \lua_now:e{require("fontspec")}
7   \RequirePackage{fontspec-luatex}
8   \endinput
9 }
```

### X $\LaTeX$

```
10 \sys_if_engine_xetex:T
11 {
12   \RequirePackage{fontspec-xetex}
13   \endinput
14 }
```

**Other** If not one of the above, error and exit.

```
15 \msg_new:nnn {fontspec} {cannot-use-pdftex}
16 {
17   The~ fontspec~ package~ requires~ either~ XeTeX~ or~ LuaTeX.\\
18   You~ must~ change~ your~ typesetting~ engine~ to,~ e.g.,~
19   "xelatex"~ or~ "lualatex"~ instead~ of~ "latex"~ or~ "pdflatex".
20 }
21 \msg_fatal:nn {fontspec} {cannot-use-pdftex}
```

**Closing** That's the end of the fontspec.sty file.

```
22 \endinput
23 </load>
```

## File III

# fontspec-code-vars.dtx

## 1 Declaration of variables

This file consists solely of declaration of variables used by fontspec. In some cases these variables are also initialised with default values. In time I would like to move these initialisations

### Booleans

`\l_@@_firsttime_bool` As `\keys_set:nn` is run multiple times, some of its information storing only occurs once while we decide if the font family has been defined or not. When the later processing is occurring per-shape this no longer needs to happen; this is indicated by the 'firsttime' conditional.

```
1 \bool_new:N \l_@@_firsttime_bool
```

*(End of definition for \l\_@@\_firsttime\_bool. This function is documented on page ??.)*

```
2 \bool_new:N \l_@@_nobf_bool
```

```
3 \bool_new:N \l_@@_noit_bool
```

```
4 \bool_new:N \l_@@_nosc_bool
```

```
5 \bool_new:N \l_@@_check_bool
```

```
6 \bool_new:N \l_@@_tfm_bool
```

```
7 \bool_new:N \l_@@_atsui_bool
```

```
8 \bool_new:N \l_@@_ot_bool
```

```
9 \bool_new:N \l_@@_mm_bool
```

```
10 \bool_new:N \l_@@_harfbuzz_bool
```

```
11 \bool_new:N \l_@@_graphite_bool
```

```
12 \bool_new:N \l_@@_fontcfg_bool
```

```
13 \bool_set_true:N \l_@@_fontcfg_bool
```

For dealing with legacy maths:

```
14 \bool_new:N \g_@@_math_euler_bool
```

```
15 \bool_new:N \g_@@_math_lucida_bool
```

```
16 \bool_new:N \g_@@_pkg_euler_loaded_bool
```

For package options:

```
17 </fontspec>
```

```
18 <*options>
```

```
19 \bool_new:N \g_@@_cfg_bool
```

```
20 \bool_new:N \g_@@_math_bool
```

```
21 </options>
```

```
22 <*fontspec>
```

```
23 \bool_new:N \l_@@_tmpa_bool
```

```
24 \bool_new:N \l_@@_disable_defaults_bool
```

```
25 \bool_new:N \l_@@_alias_bool
```

```
26 \bool_new:N \l_@@_external_bool
```

```
27 \bool_new:N \l_@@_defining_encoding_bool
```

```
28 \bool_new:N \l_@@_scriptlang_exist_bool
```

```
29 \bool_new:N \g_@@_em_normalise_slant_bool
```

```
30 \bool_new:N \l_@@_external_kpse_bool
```



`\l_@@_never_check_bool` It is used to disable checking opentype script, language, and tags when running checking code that has a user-defined return path we want to allow the higher-level code to dictate the logic. TODO: tidy this up!

```
31 \bool_new:N \l_@@_never_check_bool
```

*(End of definition for \l\_@@\_never\_check\_bool. This function is documented on page ??.)*

## Counters

```
32 \int_new:N \l_@@_script_int
33 \int_new:N \l_@@_language_int
34 \int_new:N \l_@@_strnum_int
35 \int_new:N \l_@@_tmp_int
36 \int_new:N \l_@@_tmpa_int
37 \int_new:N \l_@@_tmpb_int
38 \int_new:N \l_@@_tmpc_int
39 \int_new:N \l_@@_em_int
40 \int_new:N \l_@@_emdef_int
41 \int_new:N \l_@@_strong_int
42 \int_new:N \l_@@_strongdef_int
```

## Floats

```
43 \fp_new:N \l_@@_tmpa_fp
44 \fp_new:N \l_@@_tmpb_fp
```

## Dimensions

```
45 \dim_new:N \l_@@_tmpa_dim
46 \dim_new:N \l_@@_tmpb_dim
47 \dim_new:N \l_@@_tmpc_dim
```

## Sequences

```
48 \seq_new:N \l_@@_bf_series_seq
```

## Comma-lists

```
49 \clist_new:N \g_@@_default_fontopts_clist
50 \clist_new:N \g_@@_all_keyval_modules_clist
51 \clist_new:N \l_@@_sizefeat_clist
52 \clist_set:Nn \l_@@_sizefeat_clist {Size={-}}
53 \clist_new:N \l_@@_extensions_clist
54 \clist_new:N \l_@@_fontopts_clist
55 \clist_new:N \l_@@_family_fontopts_clist
56 \clist_new:N \l_@@_all_features_clist
57 \clist_new:N \l_@@_leftover_clist
58 \clist_new:N \l_@@_keys_leftover_clist
59 \clist_new:N \l_@@_sizing_leftover_clist
60 \clist_new:N \l_@@_fontfeat_clist
61 \clist_new:N \l_@@_fontfeat_curr_clist
62 \clist_new:N \l_@@_arg_clist
63 \clist_new:N \l_@@_this_feat_clist
```

```

64 \clist_new:N \l_@@_fontfeat_up_clist
65 \clist_new:N \l_@@_fontfeat_bf_clist
66 \clist_new:N \l_@@_fontfeat_it_clist
67 \clist_new:N \l_@@_fontfeat_bfit_clist
68 \clist_new:N \l_@@_fontfeat_sl_clist
69 \clist_new:N \l_@@_fontfeat_bfsl_clist
70 \clist_new:N \l_@@_fontfeat_sw_clist
71 \clist_new:N \l_@@_fontfeat_bfsw_clist
72 \clist_new:N \l_@@_fontfeat_sc_clist

```

### Property lists

```

73 \prop_new:N \g_@@_fontopts_prop
74 \prop_new:N \l_@@_nfss_prop
75 \prop_new:N \l_@@_nfssfont_prop
76 \prop_new:N \g_@@_OT_features_prop
77 \prop_new:N \g_@@_all_opentype_feature_names_prop
78 \prop_new:N \g_@@_em_prop
79 \prop_new:N \g_@@_strong_prop
80 \prop_new:N \g_@@_fontid_family_prop
81 \prop_new:N \g_@@_family_int_prop
82 \prop_new:N \g_@@_rawvariations_prop

```

### Token lists

#### Visible (perhaps?)

```

83 \tl_new:N \l_fontspeg_family_tl
84 \tl_new:N \g_fontspeg_encoding_tl
85 \tl_new:N \l_fontspeg_fontname_tl

```

#### 2e interactions

```

86 \tl_clear_new:N \UTFencname
87 \tl_clear_new:N \cyrillicencoding
88 \tl_clear_new:N \latinencoding

```

#### Renderer/shaper

```

89 \tl_new:N \l_@@_renderer_tl
90 \tl_new:N \l_@@_mode_tl
91 \tl_new:N \l_@@_shaper_tl
92 \tl_new:N \g_@@_defined_shapes_tl
93 \tl_new:N \g_@@_single_feat_tl
94 \tl_new:N \l_@@_basename_tl
95 \tl_new:N \g_@@_curr_series_tl
96 \tl_new:N \l_@@_curr_fontname_tl
97 \tl_new:N \l_@@_curr_bfname_tl
98 \tl_new:N \l_@@_ext_filename_tl
99 \tl_new:N \l_@@_extension_tl
100 \tl_new:N \l_@@_font_path_tl
101 \tl_new:N \l_@@_fontid_tl

```

```

102 \tl_new:N \l_@@_fontname_tl
103 \tl_new:N \l_@@_options_tl
104 \tl_new:N \l_@@_saved_fontname_tl
105 \tl_new:N \l_@@_prev_unicode_name_tl

106 \tl_new:N \g_@@_nfss_enc_tl
107 \tl_new:N \g_@@_nfss_family_tl
108 \tl_new:N \l_@@_nfss_sc_tl
109 \tl_new:N \l_@@_nfss_tl
110 \tl_new:N \l_@@_nfss_fam_tl

111 \tl_new:N \l_@@_size_tl
112 \tl_new:N \l_@@_sizedfont_tl
113 \tl_new:N \l_@@_this_font_tl
114 \tl_new:N \l_@@_ttc_index_tl
115 \tl_new:N \l_@@_smcp_shape_tl

```

### EM and STRONG

```

116 \tl_new:N \l_@@_emshape_query_tl
117 \tl_new:N \l_@@_em_switch_tl
118 \tl_new:N \l_@@_strong_switch_tl

```

### Scratch variables

```

119 \tl_new:N \l_@@_tmp_tl
120 \tl_new:N \l_@@_tmpa_tl
121 \tl_new:N \l_@@_tmpb_tl
122 \tl_new:N \l_@@_em_tmp_tl
123 \tl_new:N \l_@@_strong_tmp_tl

```

### Maths fonts

```

124 \tl_new:N \g_@@_mathrm_tl
125 \tl_new:N \g_@@_bfmathrm_tl
126 \tl_new:N \g_@@_mathsf_tl
127 \tl_new:N \g_@@_mathtt_tl

```

Defaults: (these are set elsewhere; TODO: check if redundant)

```

128 \tl_gset:Nn \g_@@_mathrm_tl {\rmdefault}
129 \tl_gset:Nn \g_@@_mathsf_tl {\sfdefault}
130 \tl_gset:Nn \g_@@_mathtt_tl {\ttdefault}

131 \tl_new:N \l_@@_family_label_tl
132 \tl_new:N \l_@@_fake_slant_tl
133 \tl_new:N \l_@@_fake_embolden_tl

```

### Internal font names

```

134 \tl_new:N \l_@@_fontname_up_tl
135 \tl_new:N \l_@@_fontname_bf_tl
136 \tl_new:N \l_@@_fontname_it_tl
137 \tl_new:N \l_@@_fontname_bfit_tl
138 \tl_new:N \l_@@_fontname_sl_tl
139 \tl_new:N \l_@@_fontname_bfsl_tl

```

```

140 \tl_new:N \l_@@_fontname_sw_tl
141 \tl_new:N \l_@@_fontname_bfsw_tl
142 \tl_new:N \l_@@_fontname_sc_tl

```

### Script and Language

```

143 \tl_new:N \l_@@_script_tl
144 \tl_new:N \l_@@_script_name_tl
145 \tl_set:Nn \l_@@_script_name_tl {CustomDefault}

146 \tl_new:N \l_@@_lang_tl
147 \tl_new:N \l_@@_lang_name_tl
148 \tl_set:Nn \l_@@_lang_name_tl {Default}

```

### Generic font features

```

149 \tl_new:N \l_@@_scale_tl
150 \tl_new:N \l_@@_hyphenchar_tl
151 \tl_new:N \l_@@_hexcol_tl
152 \tl_new:N \l_@@_opacity_tl
153 \tl_new:N \l_@@_optical_size_tl
154 \tl_new:N \l_@@_mapping_tl
155 \tl_new:N \l_@@_punctspace_adjust_tl
156 \tl_new:N \l_@@_wordspace_adjust_tl
157 \tl_new:N \l_@@_postadjust_tl
158 \tl_new:N \g_@@_instance_tl

159 \tl_const:Nn \c_@@_hexcol_tl {0000000}
160 <XE> \tl_const:Nn \c_@@_opacity_tl {FF~}
161 <LU> \tl_const:Nn \c_@@_opacity_tl {}
162 \tl_const:Nn \c_@@_postadjust_tl { \l_@@_wordspace_adjust_tl \l_@@_punctspace_adjust_tl }

```

**Semi-colon-lists** Not a real data structure but sensible to name accordingly.

```

163 \tl_new:N \g_@@_rawfeatures_sclist
164 \tl_new:N \l_@@_pre_feat_sclist

```

### Font families

```

165 \tl_new:N \l_@@_rmfamily_family_tl
166 \tl_new:N \l_@@_sffamily_family_tl
167 \tl_new:N \l_@@_ttfamily_family_tl
168 \tl_new:N \l_@@_rmfamily_encoding_tl
169 \tl_new:N \l_@@_sffamily_encoding_tl
170 \tl_new:N \l_@@_ttfamily_encoding_tl

```

## File IV

# fontspec-code-msg.dtx

## 1 Error/warning/info messages

Shorthands for messages:

```
1 \cs_new:Npn \@@_error:n { \msg_error:nn {fontspec} }
2 \cs_new:Npn \@@_error:nn { \msg_error:nnn {fontspec} }
3 \cs_new:Npn \@@_error:nx { \msg_error:nnx {fontspec} }
4 \cs_new:Npn \@@_error:nxx { \msg_error:nxxx {fontspec} }
5 \cs_new:Npn \@@_warning:n { \msg_warning:nn {fontspec} }
6 \cs_new:Npn \@@_warning:nx { \msg_warning:nnx {fontspec} }
7 \cs_new:Npn \@@_warning:nxx { \msg_warning:nxxx {fontspec} }
8 \cs_new:Npn \@@_info:n { \msg_info:nn {fontspec} }
9 \cs_new:Npn \@@_info:nx { \msg_info:nnx {fontspec} }
10 \cs_new:Npn \@@_info:nxx { \msg_info:nxxx {fontspec} }
11 \cs_new:Npn \@@_trace:n { \msg_trace:nn {fontspec} }
```

Allow messages to be written with spaces acting as normal:

```
12 \cs_generate_variant:Nn \msg_new:nnn {nxx}
13 \cs_generate_variant:Nn \msg_new:nnnn {nxxx}
14 \cs_new:Nn \@@_msg_new:n {
15   { \msg_new:nxx {fontspec} {#1} { ^^J \tl_trim_spaces:n {#2} } } }
16 \cs_new:Nn \@@_msg_new:nnn {
17   { \msg_new:nxxx {fontspec} {#1} { ^^J \tl_trim_spaces:n {#2} } { \tl_trim_spaces:n {#3} } } }
18 \char_set_catcode_space:n {32}
```

### 1.1 Errors

```
19 \@@_msg_new:nn {only-inside-encdef}
20 {
21   \exp_not:N #1 can only be used in the second argument
22   to \string\DeclareUnicodeEncoding.
23 }
24 \@@_msg_new:nn {no-size-info}
25 {
26   Size information must be supplied.\\
27   For example, SizeFeatures={Size={8-12},...}.
28 }
29 \@@_msg_new:nnn {font-not-found}
30 {
31   The font "#1" cannot be found; this may be but usually is not
32   a fontspec bug. Either there is a typo in the font name/file,
33   the font is not installed (correctly), or there is a bug
34   in the underlying font loading engine (XeTeX/luatflod).
35 }
36 {
37   A font might not be found for many reasons.\\
38   Check the spelling, where the font is installed etc. etc.\\
```

```

39   When in doubt, ask someone for help!
40   }
41   \@@_msg_new:nnn {rename-feature-not-exist}
42   {
43     The feature #1 doesn't appear to be defined.
44   }
45   {
46     It looks like you're trying to rename a feature that doesn't exist.
47   }
48   \@@_msg_new:nn {no-glyph}
49   {
50     '#1' does not contain glyph #2.
51   }
52   \@@_msg_new:nnn {euler-too-late}
53   {
54     The euler package must be loaded BEFORE fontspec.
55   }
56   {
57     fontspec only overwrites euler's attempt to
58     define the maths text fonts if fontspec is
59     loaded after euler. Type <return> to proceed
60     with incorrect \string\mathit, \string\mathbf, etc.
61   }
62   \@@_msg_new:nnn {no-xcolor}
63   {
64     Cannot load named colours without the xcolor package.
65   }
66   {
67     Sorry, I can't do anything to help. Instead of loading
68     the color package, use xcolor instead.
69   }
70   \@@_msg_new:nnn {unknown-color-model}
71   {
72     Error loading colour `#1'; unknown colour model.
73   }
74   {
75     Sorry, I can't do anything to help. Please report this error
76     to my developer with a minimal example that causes the problem.
77   }
78   \@@_msg_new:nnn {not-in-addfontfeatures}
79   {
80     The "#1" font feature cannot be used in \string\addfontfeatures.
81   }
82   {
83     This is due to how TeX loads fonts; such settings
84     are global so adding them mid-document within a group causes
85     confusion. You'll need to define multiple font families to achieve
86     what you want.
87   }

```

## 1.2 Warnings

```

88 \@@_msg_new:nn {tu-clash}
89 {
90   I have found the tuenc.def encoding definition file but the TU encoding is not
91   defined by the LaTeX2e kernel; attempting to correct but you really should update
92   to the latest version of LaTeX2e.
93 }
94 \@@_msg_new:nn {tu-missing}
95 {
96   The TU encoding seems to be missing; please update to the latest version of LaTeX2e.
97 }
98 \@@_msg_new:nn {addfontfeatures-ignored}
99 {
100  \string\addfontfeature (s) ignored \msg_line_context;;
101  it cannot be used with a font that wasn't selected by a fontspec command.\\
102  \\
103  The current font is "\use:c{font@name}".\\
104  \int_compare:nTF { \clist_count:n {#1} = 1 }
105    { The requested feature is "#1". }
106    { The requested features are "#1". }
107 }
108 \@@_msg_new:nn {feature-option-overwrite}
109 {
110   Option '#2' of font feature '#1' overwritten.
111 }
112 \@@_msg_new:nn {ot-tag-too-long}
113 {
114   OpenType tag '#1' is too long; script, language, and feature tags must be four characters or
115 }
116 \@@_msg_new:nn {aat-feature-not-exist}
117 {
118   '\l_keys_key_tl=\l_keys_value_tl' feature not supported
119   for AAT font '\l_fontspec_fontname_tl'.
120 }
121 \@@_msg_new:nn {aat-feature-not-exist-in-font}
122 {
123   AAT feature '\l_keys_key_tl=\l_keys_value_tl' (#1) not available
124   in font '\l_fontspec_fontname_tl'.
125 }
126 \@@_msg_new:nn {no-opticals}
127 {
128   '#1' doesn't appear to have an Optical Size axis.
129 }
130 \@@_msg_new:nn {script-not-exist}
131 {
132   Script '#2' not explicitly supported within font '#1'.
133   Check the typeset output, and if it is okay then ignore this warning.
134   Otherwise a different font should be chosen.
135 }
136 \@@_msg_new:nn {language-not-exist}
137 {
138   Language '#1' not explicitly supported

```

```

139   within font '\l_fontspec_fontname_tl'
140   with script '\l_@@_script_name_tl'.
141   Check the typeset output, and if it is okay then ignore this warning.
142   Otherwise a different font should be chosen.
143   }
144   \@@_msg_new:nn {only-xetex-feature}
145   {
146     Ignored XeTeX-only feature: '#1'.
147   }
148   \@@_msg_new:nn {only-luatex-feature}
149   {
150     Ignored LuaTeX-only feature: '#1'.
151   }
152   \@@_msg_new:nn {unknown-renderer}
153   {
154     Renderer '#1' unknown. Assuming Harfbuzz with 'shaper=#1'.
155     Please raise a fontspec issue to add this shaper to the interface.
156   }
157   \@@_msg_new:nn {no-mapping}
158   {
159     Input mapping not supported in LuaTeX.
160   }
161   \@@_msg_new:nn {no-mapping-ligtext}
162   {
163     Input mapping not supported in LuaTeX.\\
164     Use "Ligatures=TeX" instead of "Mapping=tex-text".
165   }

message for package options must be loaded earlier
166 </fontspec>
167 <*options>
168 \msg_new:nnn {fontspec} {cm-default-obsolete}
169 {
170   The-"cm-default"-package-option-is-obsolete.
171 }
172 \msg_new:nnn {fontspec} {enc-obsolete}
173 {
174   The-"#1"-package-option-is-obsolete.-TU-is-the-default-encoding.
175 }
176 </options>
177 <*fontspec>
178 \@@_msg_new:nn {font-index-needs-ttc}
179 {
180   The "FontIndex" feature is only supported by TTC (TrueType Collection) fonts.\\
181   Feature ignored.
182 }
183 \@@_msg_new:nn {feat-cannot-remove}
184 {
185   The "#1" feature cannot be deactivated. Request ignored.
186 }

```

### 1.3 Info messages



```

187 \@@_msg_new:nn {defining-font}
188 {
189   Font family '\g_@@_nfss_family_tl' created for font '#2'
190   with options [\l_@@_all_features_clist].\\
191   \\
192   This font family consists of the following NFSS series/shapes:\\
193   \g_@@_defined_shapes_tl
194 }
195 \@@_msg_new:nn {no-font-shape}
196 {
197   Could not resolve font "#1" (it probably doesn't exist).
198 }
199 \@@_msg_new:nn {set-scale}
200 {
201   \l_fontspeg_fontname_tl\space scale = \l_@@_scale_tl.
202 }
203 \@@_msg_new:nn {setup-math}
204 {
205   Adjusting the maths setup (use [no-math] to avoid this).
206 }
207 \@@_msg_new:nn {opa-twice}
208 {
209   Opacity set twice, in both Colour and Opacity.\\
210   Using specification "Opacity=#1".
211 }
212 \@@_msg_new:nn {opa-twice-col}
213 {
214   Opacity set twice, in both Opacity and Colour.\\
215   Using an opacity specification in hex of "#1/FF".
216 }
217 \@@_msg_new:nn {bad-colour}
218 {
219   Bad colour declaration "#1".
220   Colour must be one of:\\
221   * a named xcolor colour\\
222   * a six-digit hex colour RRGGBB\\
223   * an eight-digit hex colour RRGGBBTT with opacity
224 }

Reset 'space' behaviour:
225 \char_set_catcode_ignore:n {32}

```

## File V

# fontspec-code-opening.dtx

## 1 Opening code

### 1.1 Package options

```
1 \DeclareKeys
2 {
3   cm-default .code:n = { \msg_warning:nnn {fontspec} {cm-default-obsolete} }
4   ,math .bool_gset:N = \g_@@_math_bool
5   ,math .usage:n = preamble
6   ,math / unknown .code:n = { } % \msg_warning:nnn {fontspec} {math-opt-unknown} {#1}
7   ,no-math .bool_gset_inverse:N = \g_@@_math_bool
8   ,no-math .usage:n = preamble
9   ,config .bool_gset:N = \g_@@_cfg_bool
10  ,config .usage:n = load
11  ,no-config .bool_gset_inverse:N = \g_@@_cfg_bool
12  ,no-config .usage:n = load
13  ,euenc .code:n = { \msg_warning:nnn {fontspec} {enc-obsolete}{euenc} }
14  ,tuenc .code:n = { \msg_warning:nnn {fontspec} {enc-obsolete}{tuenc} }
15  ,quiet .code:n =
16  {
17    \msg_redirect_module:nnn { fontspec } { warning } { info }
18    \msg_redirect_module:nnn { fontspec } { info } { none }
19  }
20  ,silent .code:n =
21  {
22    \msg_redirect_module:nnn { fontspec } { warning } { none }
23    \msg_redirect_module:nnn { fontspec } { info } { none }
24  }
25  ,verbose .code:n =
26  {
27    \msg_redirect_module:nnn { fontspec } { warning } { warning }
28    \msg_redirect_module:nnn { fontspec } { info } { info }
29  }
30 }
31 \msg_new:nnn {fontspec} {math-opt-unknown}
32 {
33   The~ global~ option~ 'math=#1'~ is~ not~ recognised.~ It~ will~ be~ ignored.
34 }
35
36 \SetKeys{config,math}
37 \ProcessKeyOptions
```

### 1.2 Encodings

Now the default, with a just-in-case check:

```
38 \cs_if_exist:cF {T@TU}
```

```

39 {
40   \@@_warning:n {tu-clash}
41   \DeclareFontEncoding{TU}{-}{-}
42   \DeclareFontSubstitution{TU}{lmr}{m}{n}
43 }
44 \tl_gset:Nn \g_fontspeg_encoding_tl { TU }
45 \tl_set:Nn \rmdefault {lmr}
46 \tl_set:Nn \sfdefault {lmss}
47 \tl_set:Nn \ttdefault {lmtt}
48 \RequirePackage[\g_fontspeg_encoding_tl]{fontenc}
49 \tl_set_eq:NN \UTFencname \g_fontspeg_encoding_tl % for xunicode if needed

```

To overcome the encoding changing the current font size, but only if a class has been loaded first:

```

50 \tl_if_in:NnT \@filelist {.cls} { \normalsize }

```

Dealing with a couple of the problems introduced by babel:

```

51 \tl_set_eq:NN \cyrillicencoding \g_fontspeg_encoding_tl
52 \tl_set_eq:NN \latinencoding \g_fontspeg_encoding_tl
53 \AtBeginDocument
54 {
55   \tl_set_eq:NN \cyrillicencoding \g_fontspeg_encoding_tl
56   \tl_set_eq:NN \latinencoding \g_fontspeg_encoding_tl
57 }

```

That latin encoding definition is repeated to suppress font warnings. Something to do with `\select@language` ending up in the `.aux` file which is read at the beginning of the document.

### 1.3 Generic functions

```

\FontspecSetCheckBoolTrue
\FontspecSetCheckBoolFalse

```

These strange set functions are to simplify returning code from LuaTeX:

```

58 \cs_new:Npn \FontspecSetCheckBoolTrue { \bool_set_true:N \l_@@_check_bool }
59 \cs_new:Npn \FontspecSetCheckBoolFalse { \bool_set_false:N \l_@@_check_bool }

```

*(End of definition for `\FontspecSetCheckBoolTrue` and `\FontspecSetCheckBoolFalse`. These functions are documented on page ??.)*

```

\@@_keys_set_known:nnN

```

```

60 \cs_new:Nn \@@_keys_set_known:nnN
61 {
62 <debug> \typeout{::: Keys-set:~{#1}~{#2} }
63   \keys_set_known:nnN {#1} {#2} #3
64 <debug> \typeout{::: Leftover:~{#3} }
65 }
66 \cs_generate_variant:Nn \@@_keys_set_known:nnN {nx}

```

*(End of definition for `\@@_keys_set_known:nnN`. This function is documented on page ??.)*

```

\@@_int_mult_truncate:Nn

```

Missing in `expl3`, IMO.

```

67 \cs_new:Nn \@@_int_mult_truncate:Nn
68 {
69   \int_set:Nn #1 { \__dim_eval:w #2 #1 \__dim_eval_end: }
70 }

```

(End of definition for `\@@_int_mult_truncate:Nn`. This function is documented on page ??.)

```
\@@_lua_function:ne
\@@_lua_function:nee 71 <*LU>
\@@_lua_function:neee 72 \cs_set:Npn \@@_lua_function:ne #1#2 { \lua_now:e { fontspec.#1 ("#2")
\@@_lua_function:neeee 73 \cs_set:Npn \@@_lua_function:nee #1#2#3 { \lua_now:e { fontspec.#1 ("#2", "#3")
74 \cs_set:Npn \@@_lua_function:neee #1#2#3#4 { \lua_now:e { fontspec.#1 ("#2", "#3", "#4")
75 \cs_set:Npn \@@_lua_function:neeee #1#2#3#4#5 { \lua_now:e { fontspec.#1 ("#2", "#3", "#4", "#5")
76 </LU>
```

(End of definition for `\@@_lua_function:ne` and others. These functions are documented on page ??.)

## 1.4 expl3 variants

```
77 \cs_generate_variant:Nn \int_set:Nn {Nv}
78 \cs_generate_variant:Nn \prop_gput_if_not_in:Nnn {NeV}
79 \cs_generate_variant:Nn \prop_gput:Nnn {Nxn} % needed by unicode-math
80 \cs_generate_variant:Nn \tl_if_empty:nF {f}
81 \cs_generate_variant:Nn \tl_if_eq:nnT {oe}
```

## File VI

# fontspec-code-fontload.dtx

## 1 expl3 interface for primitive font loading

\@@\_primitive\_font\_set:Nnn

\@@\_primitive\_font\_gset:Nnn

```
1 \cs_set:Npn \@@_primitive_font_set:Nnn #1#2#3
2 {
3   \font #1 = #2 ~at~ \dim_eval:n {#3} \scan_stop:
4 }
5 \cs_set:Npn \@@_primitive_font_gset:Nnn #1#2#3
6 {
7   \global \font #1 = #2 ~at~ \dim_eval:n {#3} \scan_stop:
8 }
```

*(End of definition for \@@\_primitive\_font\_set:Nnn and \@@\_primitive\_font\_gset:Nnn. These functions are documented on page ??.)*

\@@\_font\_suppress\_not\_found\_error:

```
9 \cs_set:Npn \@@_font_suppress_not_found_error:
10 {
11   \int_set:Nn \suppressfontnotfounderror {1}
12 }
```

*(End of definition for \@@\_font\_suppress\_not\_found\_error:. This function is documented on page ??.)*

\@@\_primitive\_font\_if\_null\_p:N

\@@\_primitive\_font\_if\_null:NTF

```
13 \prg_new_conditional:Nnn \@@_primitive_font_if_null:N {p,TF,T,F}
14 {
15   \ifx #1 \nullfont
16     \prg_return_true:
17   \else
18     \prg_return_false:
19   \fi
20 }
```

*(End of definition for \@@\_primitive\_font\_if\_null:NTF. This function is documented on page ??.)*

\@@\_primitive\_font\_set\_p:NnnTF

\@@\_primitive\_font\_set:NnnTFTF

\@@\_primitive\_font\_gset\_p:NnnTF

\@@\_primitive\_font\_gset:NnnTFTF

```
21 \prg_new_conditional:Nnn \@@_primitive_font_set:Nnn {TF,T,F}
22 {
23   \@@_primitive_font_set:Nnn #1 {#2} {#3}
24   \@@_primitive_font_if_null:NTF #1 {\prg_return_false:} {\prg_return_true:}
25 }
26 \prg_new_conditional:Nnn \@@_primitive_font_gset:Nnn {TF,T,F}
27 {
28   \@@_primitive_font_gset:Nnn #1 {#2} {#3}
29   \@@_primitive_font_if_null:NTF #1 {\prg_return_false:} {\prg_return_true:}
30 }
31 \cs_set:Npn \@@_primitive_font_set:Omm { \exp_last_unbraced:No \@@_primitive_font_set:Nnn }
```

```

32 \cs_set:Npn \@@_primitive_font_set:0nnF { \exp_last_unbraced:No \@@_primitive_font_set:NnnF }
33 \cs_set:Npn \@@_primitive_font_gset:0nn { \exp_last_unbraced:No \@@_primitive_font_gset:Nnn }
34 \cs_set:Npn \@@_primitive_font_gset:0nnF { \exp_last_unbraced:No \@@_primitive_font_gset:NnnF }

```

*(End of definition for \@@\_primitive\_font\_set:NnnTTF and \@@\_primitive\_font\_gset:NnnTTF. These functions are documented on page ??.)*

`\@@_primitive_font_if_exist:nTF`

```

35 \prg_new_conditional:Nnn \@@_primitive_font_if_exist:n {TF,T,F}
36 {
37   \group_begin:
38   \@@_font_suppress_not_found_error:
39   \@@_primitive_font_set:Nnn \l_@@_primitive_font_{#1} { \f@size pt - 1sp }
40   \@@_primitive_font_if_null:NTF \l_@@_primitive_font
41   { \group_end: \prg_return_false: }
42   { \group_end: \prg_return_true: }
43 }

```

*(End of definition for \@@\_primitive\_font\_if\_exist:nTF. This function is documented on page ??.)*

`\@@_primitive_font_glyph_if_exist:NnTF`

```

44 \prg_new_conditional:Nnn \@@_primitive_font_glyph_if_exist:Nn {p,TF,T,F}
45 {
46   \tex_iffontchar:D #1 #2 \scan_stop:
47   \prg_return_true:
48   \else:
49   \prg_return_false:
50   \fi:
51 }

```

*(End of definition for \@@\_primitive\_font\_glyph\_if\_exist:NnTF. This function is documented on page ??.)*

`\@@_primitive_font_set_hyphenchar:Nn`

```

52 \cs_new:Nn \@@_primitive_font_set_hyphenchar:Nn
53 {
54   \tex_hyphenchar:D #1 = #2 \scan_stop:
55 }

```

*(End of definition for \@@\_primitive\_font\_set\_hyphenchar:Nn. This function is documented on page ??.)*

`\@@_primitive_font_get_name:N`

`\@@_primitive_font_current_name:`

```

56 \cs_new_eq:NN \@@_primitive_font_get_name:N \fontname
57 \cs_new:Npn \@@_primitive_font_current_name:
58 {
59   \@@_primitive_font_get_name:N \tex_font:D
60 }

```

*(End of definition for \@@\_primitive\_font\_get\_name:N and \@@\_primitive\_font\_current\_name:. These functions are documented on page ??.)*

## File VII

# fontspec-code-interfaces.dtx

## 1 User commands

This section contains the definitions of the commands detailed in the user documentation. Only the 'top level' definitions of the commands are contained herein; they all use or define macros which are defined or used later on in [Section 1 on page 27](#).

```
1 \NewDocumentCommand \fontspec { 0{} m 0{} }
2 {
3   \@@_main_fontspec:nn {#1,#3} {#2}
4   \ignorespaces
5 }
6 \NewDocumentCommand \setmainfont { 0{} m 0{} }
7 {
8   \@@_main_setmainfont:nn {#1,#3} {#2}
9   \ignorespaces
10 }
11 \NewDocumentCommand \setsansfont { 0{} m 0{} }
12 {
13   \@@_main_setsansfont:nn {#1,#3} {#2}
14   \ignorespaces
15 }
16 \NewDocumentCommand \setmonofont { 0{} m 0{} }
17 {
18   \@@_main_setmonofont:nn {#1,#3} {#2}
19   \ignorespaces
20 }
21 \NewDocumentCommand \setmathrm { 0{} m 0{} }
22 {
23   \@@_main_setmathrm:nn {#1,#3} {#2}
24 }
25 \NewDocumentCommand \setboldmathrm { 0{} m 0{} }
26 {
27   \@@_main_setboldmathrm:nn {#1,#3} {#2}
28 }
29 \NewDocumentCommand \setmathsf { 0{} m 0{} }
30 {
31   \@@_main_setmathsf:nn {#1,#3} {#2}
32 }
33 \NewDocumentCommand \setmathtt { 0{} m 0{} }
34 {
35   \@@_main_setmathtt:nn {#1,#3} {#2}
36 }
```

`\setromanfont` This is the old name for `\setmainfont`, retained *ad infinitum* for backwards compatibility. It was deprecated in 2010.

```

37 \NewDocumentCommand \setromanfont { O{} m O{} }
38 {
39   \@@_main_setmainfont:nn {#1,#3} {#2}
40 }

```

(End of definition for `\setromanfont`. This function is documented on page ??.)

```

41 \NewDocumentCommand \newfontfamily { m O{} m O{} }
42 {
43   \@@_main_newfontfamily:NnnN #1 {#2,#4} {#3} \NewDocumentCommand
44 }
45 \NewDocumentCommand \renewfontfamily { m O{} m O{} }
46 {
47   \@@_main_newfontfamily:NnnN #1 {#2,#4} {#3} \RenewDocumentCommand
48 }
49 \NewDocumentCommand \setfontfamily { m O{} m O{} }
50 {
51   \@@_main_newfontfamily:NnnN #1 {#2,#4} {#3} \DeclareDocumentCommand
52 }
53 \NewDocumentCommand \providefontfamily { m O{} m O{} }
54 {
55   \@@_main_newfontfamily:NnnN #1 {#2,#4} {#3} \ProvideDocumentCommand
56 }
57 \NewDocumentCommand \newfontface { m O{} m O{} }
58 {
59   \@@_main_newfontface:NnnN #1 {#2,#4} {#3} \NewDocumentCommand
60 }
61 \NewDocumentCommand \renewfontface { m O{} m O{} }
62 {
63   \@@_main_newfontface:NnnN #1 {#2,#4} {#3} \RenewDocumentCommand
64 }
65 \NewDocumentCommand \setfontface { m O{} m O{} }
66 {
67   \@@_main_newfontface:NnnN #1 {#2,#4} {#3} \DeclareDocumentCommand
68 }
69 \NewDocumentCommand \providefontface { m O{} m O{} }
70 {
71   \@@_main_newfontface:NnnN #1 {#2,#4} {#3} \ProvideDocumentCommand
72 }

```

`\defaultfontfeatures` This macro takes one argument that consists of all of feature options that will be applied by default to all subsequent `\fontspec` commands.

```

73 \NewDocumentCommand \defaultfontfeatures { t+ o m }
74 {
75   \IfNoValueTF {#2}
76     { \@@_set_default_features:nn {#1} {#3} }
77     { \@@_set_font_default_features:nnn {#1} {#2} {#3} }

```



```

78     \ignorespaces
79   }

(End of definition for \defaultfontfeatures. This function is documented on page ??.)

80 \NewDocumentCommand \addfontfeatures {m}
81   {
82     \@@_main_addfontfeatures:n {#1}
83   }

84 \NewDocumentCommand \addfontfeature {m}
85   {
86     \@@_main_addfontfeatures:n {#1}
87   }

88 \NewDocumentCommand \newfontfeature {mm}
89   {
90     \@@_main_newfontfeature:nn {#1} {#2}
91   }

92 \NewDocumentCommand \newAATfeature {mmmm}
93   {
94     \@@_main_newAATfeature:nnnn {#1} {#2} {#3} {#4}
95   }

96 \NewDocumentCommand \newopentypefeature {mmm}
97   {
98     \@@_main_newopentypefeature:nnn {#1} {#2} {#3}
99   }

```

`\newICUfeature` Deprecated.

```

100 \NewDocumentCommand \newICUfeature {mmm}
101   {
102     \@@_main_newopentypefeature:nnn {#1} {#2} {#3}
103   }

(End of definition for \newICUfeature. This function is documented on page ??.)

104 \NewDocumentCommand \aliasfontfeature {mm}
105   {
106     \@@_main_aliasfontfeature:nn {#1} {#2}
107   }

108 \NewDocumentCommand \aliasfontfeatureoption {mmm}
109   {
110     \@@_main_aliasfontfeatureoption:nnn {#1} {#2} {#3}
111   }

```

`\newfontscript` Mostly used internally, but also possibly useful for users, to define new OpenType ‘scripts’, mapping logical names to OpenType script tags.

```

112 \NewDocumentCommand \newfontscript {mm}
113   {
114     \fontspec_new_script:nn {#1} {#2}
115   }

(End of definition for \newfontscript. This function is documented on page ??.)

```

`\newfontlanguage` Mostly used internally, but also possibly useful for users, to define new OpenType ‘languages’, mapping logical names to OpenType language tags.

```
116 \NewDocumentCommand \newfontlanguage {mm}
117   {
118     \fontspec_new_lang:nn {#1} {#2}
119   }
```

*(End of definition for \newfontlanguage. This function is documented on page ??.)*

```
120 \NewDocumentCommand \DeclareFontExtensions {m}
121   {
122     \@@_main_DeclareFontExtensions:n {#1}
123   }
124 \NewDocumentCommand \IfFontFeatureActiveTF {mmm}
125   {
126     \@@_main_IfFontFeatureActiveTF:nnn {#1} {#2} {#3}
127   }
```

`\oldstylenums` This is performed only after the preamble to overwrite any redefinition by textcomp:

```
128 \AtBeginDocument
129   {
130     \RenewDocumentCommand \oldstylenums {m}
131       {
132         \@@_main_oldstylenums:n {#1}
133       }
134   }
```

*(End of definition for \oldstylenums. This function is documented on page ??.)*

`\liningnums`

```
135 \NewDocumentCommand \liningnums {m}
136   {
137     \@@_main_liningnums:n {#1}
138   }
```

*(End of definition for \liningnums. This function is documented on page ??.)*

## File VIII

# fontspec-code-user.dtx

## 1 User command internals

### 1.1 Font selection

`\@@_main_fontspec:nn` This is the main command of the package that selects fonts with various features. It takes two arguments: the font name and the optional requested features of that font.

```
1 \cs_new:Nn \@@_main_fontspec:nn
2   {
3     \fontspec_set_family:Nnn \f@family {#1} {#2}
4     \fontencoding { \g_@@_nfss_enc_tl }
5     \selectfont
6   }
```

*(End of definition for \@@\_main\_fontspec:nn. This function is documented on page ??.)*

`\rmfamily` Add an encoding switch to the three family commands.

```
\sffamily
\ttfamily
7 \cs_if_exist:NTF \@rmfamilyhook
8   {
9     \tl_put_right:Nn \@rmfamilyhook {\fontencoding \l_@@_rmfamily_encoding_tl}
10    \tl_put_right:Nn \@sffamilyhook {\fontencoding \l_@@_sffamily_encoding_tl}
11    \tl_put_right:Nn \@ttfamilyhook {\fontencoding \l_@@_ttfamily_encoding_tl}
12  }
13  {
14    \tl_replace_all:cnn { rmfamily~ } { \fontfamily }
15    { \fontencoding \l_@@_rmfamily_encoding_tl \fontfamily }
16    \tl_replace_all:cnn { sffamily~ } { \fontfamily }
17    { \fontencoding \l_@@_sffamily_encoding_tl \fontfamily }
18    \tl_replace_all:cnn { ttfamily~ } { \fontfamily }
19    { \fontencoding \l_@@_ttfamily_encoding_tl \fontfamily }
20  }
21  \tl_set:Nn \l_@@_rmfamily_encoding_tl { \encodingdefault }
22  \tl_set:Nn \l_@@_sffamily_encoding_tl { \encodingdefault }
23  \tl_set:Nn \l_@@_ttfamily_encoding_tl { \encodingdefault }
```

*(End of definition for \rmfamily, \sffamily, and \ttfamily. These functions are documented on page ??.)*

`\setmainfont` The following three macros perform equivalent operations setting the default font for a particular family: ‘roman’, sans serif, or typewriter (monospaced).

They end with `\normalfont` so that if they’re used in the document, the change registers immediately.

```
24 \cs_new:Nn \@@_main_setmainfont:nn
25   {
26   (debug)\typeout{::~~_main_setmainfont:nn}
27   \ifdefined\DeclareFontSeriesDefault
28     \DeclareFontSeriesDefault[rm]{bf}{\bfdefault}
29   \fi
30   \fontspec_set_family:Nnn \l_@@_rmfamily_family_tl {#1} {#2}
```

```

31 \tl_set_eq:NN \rmdefault \l_@@_rmfamily_family_tl
32 \tl_set_eq:NN \l_@@_rmfamily_encoding_tl \g_@@_nfss_enc_tl
33 \str_if_eq:eeT {\familydefault} {\rmdefault}
34 { \tl_set_eq:NN \encodingdefault \g_@@_nfss_enc_tl }
35 \@@_setmainfont_hook:nn {#1} {#2} % for unicode-math only
36 \normalfont
37 }

```

(End of definition for `\setmainfont`. This function is documented on page ??.)

`\setsansfont` Same as above.

```

38 \cs_new:Nn \@@_main_setsansfont:nn
39 {
40 \ifdefined\DeclareFontSeriesDefault
41 \DeclareFontSeriesDefault[sf]{bf}{\bfdefault}
42 \fi
43 \fontspec_set_family:Nnn \l_@@_sffamily_family_tl {#1} {#2}
44 \tl_set_eq:NN \sfdefault \l_@@_sffamily_family_tl
45 \tl_set_eq:NN \l_@@_sffamily_encoding_tl \g_@@_nfss_enc_tl
46 \str_if_eq:eeT {\familydefault} {\sfdefault}
47 { \tl_set_eq:NN \encodingdefault \g_@@_nfss_enc_tl }
48 \@@_setsansfont_hook:nn {#1} {#2} % for unicode-math only
49 \normalfont
50 }

```

(End of definition for `\setsansfont`. This function is documented on page ??.)

`\setmonofont` Same as above.

```

51 \cs_new:Nn \@@_main_setmonofont:nn
52 {
53 \ifdefined\DeclareFontSeriesDefault
54 \DeclareFontSeriesDefault[tt]{bf}{\bfdefault}
55 \fi
56 \fontspec_set_family:Nnn \l_@@_ttfamily_family_tl {#1} {#2}
57 \tl_set_eq:NN \ttdefault \l_@@_ttfamily_family_tl
58 \tl_set_eq:NN \l_@@_ttfamily_encoding_tl \g_@@_nfss_enc_tl
59 \str_if_eq:eeT {\familydefault} {\ttdefault}
60 { \tl_set_eq:NN \encodingdefault \g_@@_nfss_enc_tl }
61 \@@_setmonofont_hook:nn {#1} {#2} % for unicode-math only
62 \normalfont
63 }

```

(End of definition for `\setmonofont`. This function is documented on page ??.)

`\setmathrm` These commands are analogous to `\setmainfont` and others, but for selecting the font used for `\mathrm`, etc. They can only be used in the preamble of the document. `\setboldmathrm` is used for specifying which fonts should be used in `\boldmath`.

```

64 \cs_new:Nn \@@_main_setmathrm:nn
65 {
66 (XE) \fontspec_gset_family:Nnn \g_@@_mathrm_tl {#1} {#2}
67 (LU) \fontspec_gset_family:Nnn \g_@@_mathrm_tl {Renderer=Basic,#1} {#2}
68 \@@_setmathrm_hook:nn {#1} {#2} % for unicode-math only
69 }

```

(End of definition for `\setmathrm`. This function is documented on page ??.)

`\setboldmathrm`

```
70 \cs_new:Nn \@@_main_setboldmathrm:nn
71 {
72 (XE) \fontspec_gset_family:Nnn \g_@@_bfmathrm_tl {#1} {#2}
73 (LU) \fontspec_gset_family:Nnn \g_@@_bfmathrm_tl {Renderer=Basic,#1} {#2}
74 \@@_setboldmathrm_hook:nn {#1} {#2} % for unicode-math only
75 }
```

(End of definition for `\setboldmathrm`. This function is documented on page ??.)

`\setmathsf`

```
76 \cs_new:Nn \@@_main_setmathsf:nn
77 {
78 (XE) \fontspec_gset_family:Nnn \g_@@_mathsf_tl {#1} {#2}
79 (LU) \fontspec_gset_family:Nnn \g_@@_mathsf_tl {Renderer=Basic,#1} {#2}
80 \@@_setmathsf_hook:nn {#1} {#2} % for unicode-math only
81 }
```

(End of definition for `\setmathsf`. This function is documented on page ??.)

`\setmathtt`

```
82 \cs_new:Nn \@@_main_setmathtt:nn
83 {
84 (XE) \fontspec_gset_family:Nnn \g_@@_mathtt_tl {#1} {#2}
85 (LU) \fontspec_gset_family:Nnn \g_@@_mathtt_tl {Renderer=Basic,#1} {#2}
86 \@@_setmathtt_hook:nn {#1} {#2} % for unicode-math only
87 }
```

(End of definition for `\setmathtt`. This function is documented on page ??.)

Hooks:

```
88 \cs_set_eq:NN \@@_setmainfont_hook:nn \use_none:nn
89 \cs_set_eq:NN \@@_setsansfont_hook:nn \use_none:nn
90 \cs_set_eq:NN \@@_setmonofont_hook:nn \use_none:nn
91 \cs_set_eq:NN \@@_setmathrm_hook:nn \use_none:nn
92 \cs_set_eq:NN \@@_setmathsf_hook:nn \use_none:nn
93 \cs_set_eq:NN \@@_setmathtt_hook:nn \use_none:nn
94 \cs_set_eq:NN \@@_setboldmathrm_hook:nn \use_none:nn
```

Hmm, this isn't necessary with unicode-math; oh well:

```
95 \@onlypreamble\setmathrm
96 \@onlypreamble\setboldmathrm
97 \@onlypreamble\setmathsf
98 \@onlypreamble\setmathtt
```

If the commands above are not executed, then `\rmdefault` (*etc.*) will be used.

```
99 \tl_gset:Nn \g_@@_mathrm_tl {\rmdefault}
100 \tl_gset:Nn \g_@@_mathsf_tl {\sfdefault}
101 \tl_gset:Nn \g_@@_mathtt_tl {\ttdefault}
```

`\@@_main_newfontfamily:NnnN` The inner fontspec workings define a font family, which is then used in a typical NFSS `\fontfamily` declaration, saved in the macro name specified. The fourth argument determines which xparse function to set the macro with (new/renew/etc).

```

102 \cs_new:Nn \@@_main_newfontfamily:NnnN
103   {
104     \fontspec_set_family:cnn { l_@@_ \cs_to_str:N #1 _family_tl } {#2} {#3}
105     \use:x
106     {
107       \exp_not:N #4 \exp_not:N #1 {}
108       {
109         \exp_not:N \fontfamily { \use:c { l_@@_ \cs_to_str:N #1 _family_tl } }
110         \exp_not:N \fontencoding { \g_@@_nfss_enc_tl }
111         \exp_not:N \selectfont
112       }
113     }
114   }

```

*(End of definition for \@@\_main\_newfontfamily:NnnN. This function is documented on page ??.)*

`\@@_main_newfontface:NnnN` `\newfontface` uses the fact that if the argument to `BoldFont`, etc., is empty (*i.e.*, `BoldFont={}`), then no bold font is searched for.

```

115 \cs_new:Nn \@@_main_newfontface:NnnN
116   {
117     \@@_main_newfontfamily:NnnN #1 { BoldFont={},ItalicFont={},SmallCapsFont={},#2 } {#3} #4
118   }

```

*(End of definition for \@@\_main\_newfontface:NnnN. This function is documented on page ??.)*

## 1.2 Font feature selection

`\@@_set_default_features:nn`

```

119 \cs_new:Nn \@@_set_default_features:nn
120   {
121     \IfBooleanTF {#1} \clist_gput_right:Nn \clist_gset:Nn
122       \g_@@_default_fontopts_clist {#2}
123   }

```

*(End of definition for \@@\_set\_default\_features:nn. This function is documented on page ??.)*

`\@@_set_font_default_features:nnn` The optional argument #2 specifies font identifier(s). Branch for either (a) single token input such as `\rmdefault`, or (b) otherwise assume its a fontname. In that case, strip spaces and file extensions and lower-case to ensure consistency.

```

124 \cs_new:Nn \@@_set_font_default_features:nnn
125   {
126     <debug> \typeout{\unexpanded[_set_font_default_features:nnn:{#1}{#2}{#3}}}
127     \clist_map_inline:nn {#2}
128     {
129       \tl_if_single:nTF {##1}
130         { \tl_set:No \l_@@_tmp_tl { \cs:w l_@@_ \cs_to_str:N ##1 _family_tl\cs_end: } }
131         { \@@_sanitize_fontname:Nn \l_@@_tmp_tl {##1} }
132     }

```

```

133 \IfBooleanTF {#1}
134 {
135   \prop_get:NVNF \g_@@_fontopts_prop \l_@@_tmp_tl \l_@@_tmpb_tl
136   { \tl_clear:N \l_@@_tmpb_tl }
137   \tl_put_right:Nn \l_@@_tmpb_tl {#3,}
138   \prop_gput:NVV \g_@@_fontopts_prop \l_@@_tmp_tl \l_@@_tmpb_tl
139 }
140 {
141   \tl_if_empty:nTF {#3}
142   { \prop_gremove:NV \g_@@_fontopts_prop \l_@@_tmp_tl }
143   { \prop_gput:NVn \g_@@_fontopts_prop \l_@@_tmp_tl {#3,} }
144 }
145 }
146 }

```

(End of definition for `\@@_set_font_default_features:nnn`. This function is documented on page ??.)

**\addfontfeatures** In order to be able to extend the feature selection of a given font, two things need to be known: the currently selected features, and the currently selected font. Every time a font family is created, this information is saved inside a control sequence with the name of the font family itself.

This macro extracts this information, then appends the requested font features to add to the already existing ones, and calls the font again with the top level `\fontspec` command.

The default options are *not* applied (which is why `\g_fontspec_default_fontopts_tl` is emptied inside the group; this is allowed as `\l_fontspec_family_tl` is globally defined in `\@@_select_font_family:nn`), so this means that the only added features to the font are strictly those specified by this command.

`\addfontfeature` is defined as an alias, as I found that I often typed this instead when adding only a single font feature.

```

147 \cs_new:Nn \@@_main_addfontfeatures:n
148 {
149 <debug> \typeout{^^J:.....:^^J: addfontfeatures}
150   \fontspec_if_fontspec_font:TF
151   {
152     \group_begin:
153     \keys_set_known:nnN {fontspec-addfeatures} {#1} \l_@@_tmp_tl
154     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {options} \l_@@_options_tl
155     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {fontname} \l_@@_fontname_tl
156     \bool_set_true:N \l_@@_disable_defaults_bool
157 <debug> \typeout{ \@@_select_font_family:nn { \l_@@_options_tl , #1 } {\l_@@_fontname_tl} }
158     \use:x
159     {
160       \@@_select_font_family:nn
161       { \l_@@_options_tl , #1 } {\l_@@_fontname_tl}
162     }
163     \group_end:
164     \fontfamily \g_@@_nfss_family_tl \selectfont
165   }
166   {
167     \@@_warning:nx {addfontfeatures-ignored} {#1}
168   }

```

```

169     \ignorespaces
170   }

```

*(End of definition for \addfontfeatures. This function is documented on page ??.)*

### 1.3 Defining new font features

`\newfontfeature` `\newfontfeature` takes two arguments: the name of the feature tag by which to reference it, and the string that is used to select the font feature.

```

171 \cs_new:Nn \@@_main_newfontfeature:nn
172   {
173     \keys_define:nn { fontspec }
174       {
175         #1 .code:n = { \@@_update_featstr:n {#2} }
176       }
177   }

```

*(End of definition for \newfontfeature. This function is documented on page ??.)*

`\newAATfeature` This command assigns a new AAT feature by its code (`#2`,`#3`) to a new name (`#1`). Better than `\newfontfeature` because it checks if the feature exists in the font it's being used for.

```

178 \cs_new:Nn \@@_main_newAATfeature:nnnn
179   {
180     \keys_if_exist:nnF { fontspec } {#1}
181       { \@@_define_aat_feature_group:n {#1} }
182
183     \keys_if_choice_exist:nnnT {fontspec} {#1} {#2}
184       { \@@_warning:nxx {feature-option-overwrite} {#1} {#2} }
185
186     \@@_define_aat_feature:nnnn {#1}{#2}{#3}{#4}
187   }

```

*(End of definition for \newAATfeature. This function is documented on page ??.)*

`\newopentypefeature` This command assigns a new OpenType feature by its abbreviation (`#2`) to a new name (`#1`). Better than `\newfontfeature` because it checks if the feature exists in the font it's being used for.

```

188 \cs_new:Nn \@@_main_newopentypefeature:nnn
189   {
190     \keys_if_exist:nnF { fontspec / options } {#1}
191       { \@@_define_opentype_feature_group:n {#1} }
192
193     \keys_if_choice_exist:nnnT {fontspec} {#1} {#2}
194       { \@@_warning:nxx {feature-option-overwrite} {#1} {#2} }
195
196     \exp_args:Nnnx \@@_define_opentype_feature:nnnnn
197       {#1} {#2} { \@@_strip_plus_minus:n {#3} } {#3} {}
198   }

```



```

200 \cs_new:Nn \@@_strip_plus_minus:n { \@@_strip_plus_minus_aux:Nq #1 \q_nil }
201 \cs_new:Npn \@@_strip_plus_minus_aux:Nq #1#2 \q_nil
202 {
203   \str_case:nnF {#1} { {+} {#2} {-} {#2} } {#1#2}
204 }

```

(End of definition for \newopentypefeature. This function is documented on page ??.)

**\aliasfontfeature** User commands for renaming font features and font feature options.

```

205 \cs_new:Nn \@@_main_aliasfontfeature:nn
206 {
207   (debug) \typeout{::::::::::::::::::::::::::^J:: aliasfontfeature{#1}{#2}}
208   \bool_set_false:N \l_@@_alias_bool
209   \clist_map_inline:Nn \g_@@_all_keyval_modules_clist
210   {
211     \keys_if_exist:nnT {##1} {#1}
212     {
213       (debug) \typeout{::: Key~exists~##1~/~#1}
214       \bool_set_true:N \l_@@_alias_bool
215       \keys_define:nn {##1}
216       { #2 .code:n = { \keys_set:nn {##1} { #1 = {####1} } } }
217     }
218   }
219   \bool_if:NF \l_@@_alias_bool
220   { \@@_warning:nx {rename-feature-not-exist} {#1} }
221 }

```

(End of definition for \aliasfontfeature. This function is documented on page ??.)

**\aliasfontfeatureoption**

```

223 \cs_new:Nn \@@_main_aliasfontfeatureoption:nnn
224 {
225   \bool_set_false:N \l_@@_alias_bool
226   \clist_map_inline:Nn \g_@@_all_keyval_modules_clist
227   {
228     \keys_if_exist:nnT { ##1 / #1 } {#2}
229     {
230       (debug) \typeout{::: Keyval~exists~##1~/~#1~~#2}
231       \bool_set_true:N \l_@@_alias_bool
232       \keys_define:nn { ##1 / #1 }
233       { #3 .code:n = { \keys_set:nn {##1} { #1 = {#2} } } }
234     }
235     \keys_if_exist:nnT { ##1 / #1 } {#2Reset}
236     {
237       (debug) \typeout{::: Keyval~exists~##1~/~#1~~#2Reset}
238       \keys_define:nn { ##1 / #1 }
239       { #3Reset .code:n = { \keys_set:nn {##1} { #1 = {#2Reset} } } }
240     }
241   }
242 }

```

```

243
244     \keys_if_exist:nnT { ##1 / #1 } {#20ff}
245     {
246 (debug) \typeout{::: Keyval~exists~##1~/~#1~=#20ff}
247         \keys_define:nn { ##1 / #1 }
248             { #30ff .code:n = { \keys_set:nn {##1} { #1 = {#20ff} } } }
249     }
250 }
251
252 \bool_if:NF \l_@@_alias_bool
253 { \@@_warning:nx {rename-feature-not-exist} {#1/#2} }
254 }

```

*(End of definition for \aliasfontfeatureoption. This function is documented on page ??.)*

\@@\_main\_DeclareFontExtensions:n

```

255 \cs_new:Nn \@@_main_DeclareFontExtensions:n
256 {
257     \clist_set:Nn \l_@@_extensions_clist { #1 }
258 }

```

Defaults:

```

259 \@@_main_DeclareFontExtensions:n { .otf, .ttf, .OTF, .TTF, .ttc, .TTC, .dfont }

```

*(End of definition for \@@\_main\_DeclareFontExtensions:n. This function is documented on page ??.)*

## 1.4 High level conditionals

\IfFontFeatureActiveTF

```

260 \cs_new:Nn \@@_main_IfFontFeatureActiveTF:nnn
261 {
262 (debug) \typeout{^^J::::::::::::::::::::::::::::::::::::::::::::::::::}
263 (debug) \typeout{:IfFontFeatureActiveTF \exp_not:n{#{#1}{#2}{#3}}}
264     \@@_if_font_feature:nTF {#1} {#2} {#3}
265 }
266 \prg_new_conditional:Nnn \@@_if_font_feature:n {TF}
267 {
268     \tl_gclear:N \g_@@_single_feat_tl
269     \group_begin:
270         \@@_font_suppress_not_found_error:
271         \@@_init:
272         \bool_set_true:N \l_@@_ot_bool
273         \bool_set_true:N \l_@@_never_check_bool
274         \bool_set_false:N \l_@@_firsttime_bool
275         \clist_clear:N \l_@@_fontfeat_clist
276         \@@_get_features:n {#1}
277     \group_end:
278
279 (debug) \typeout{::: > \exp_not:N\g_@@_rawfeatures_sclist->~{\g_@@_rawfeatures_sclist}}
280 (debug) \typeout{::: > \exp_not:N\g_@@_single_feat_tl->~{\g_@@_single_feat_tl}}
281
282     \tl_if_empty:NTF \g_@@_single_feat_tl { \prg_return_false: }

```

```

283     {
284     \exp_args:NV \fontspec_if_current_feature:nTF \g_@@_single_feat_tl
285     { \prg_return_true: } { \prg_return_false: }
286     }
287 }

```

*(End of definition for \IfFontFeatureActiveTF. This function is documented on page ??.)*

## 1.5 \oldstylenums and \liningnums

`\oldstylenums` This command needs a redefinition. And we may as well provide the reverse command.

```

\liningnums 288 \cs_new_protected:Nn \@@_main_oldstylenums:n
289 {
290   \group_begin:
291   \addfontfeature{Numbers=OldStyle}
292   #1
293   \group_end:
294 }
295 \cs_new_protected:Nn \@@_main_liningnums:n
296 {
297   \group_begin:
298   \addfontfeature{Numbers=Lining}
299   #1
300   \group_end:
301 }

```

*(End of definition for \oldstylenums and \liningnums. These functions are documented on page ??.)*

## File IX

# fontspec-code-api.dtx

## 1 Programmer's interface

These functions are not used directly by fontspec when defining fonts; they are designed to be used by other packages who wish to do font-related things on top of fontspec itself.

Because I haven't fully explored how these functions will behave in practise, I am not giving them user-level names. As it becomes more clear which of these should be accessible by document writers, I'll open them up a little more.

All functions are defined assuming that the font to be queried is currently selected as a fontspec font. (I.e., via `\fontspec` or from a `\newfontfamily` macro or from `\setmainfont` and so on.)

## 2 Overview

### 2.1 Commands

---

`\fontspec_gset_family:Nnn` `\fontspec_set_family:Nnn`  $\langle family \rangle$   $\{\langle features \rangle\}$   $\{\langle font name \rangle\}$

`\fontspec_set_family:Nnn`

Defines a new NFSS font family from given  $\langle features \rangle$  and  $\langle font \rangle$ , and stores the name in the token list variable  $\langle family \rangle$ . See the standard fontspec user commands for applications of this function.

---

`\fontspec_gset_fontface:NNnn` `\fontspec_set_fontface:NNnn`  $\langle face \rangle$   $\langle family \rangle$   $\{\langle features \rangle\}$   $\{\langle font name \rangle\}$

`\fontspec_set_fontface:NNnn`

As for `\fontspec_set_family:Nnn` but with a single font face only. (E.g., no bold, italic shapes, etc.) The control sequence  $\langle face \rangle$  is a primitive T<sub>E</sub>X font command.

### 2.2 Conditionals

---

`\fontspec_font_if_exist:nTF` `\fontspec_font_if_exist:nTF`  $\{\langle font name \rangle\}$  Argtrue code  $\{\langle false code \rangle\}$

Does this font exist? The font name can refer to the 'logical' name or to a filename with known font extension.

---

`\fontspec_if_fontspec_font:TF` `\fontspec_if_fontspec_font:TF`  $\{\langle true code \rangle\}$   $\{\langle false code \rangle\}$

---

`\fontspec_if_aat_feature:nnTF` `\fontspec_if_aat_feature:nnTF`  $\{\langle true code \rangle\}$   $\{\langle false code \rangle\}$

---

`\fontspec_if_opentype:TF` `\fontspec_if_opentype:TF`  $\{\langle true code \rangle\}$   $\{\langle false code \rangle\}$

<u>\fontspec_if_feature:nTF</u>	\fontspec_if_feature:nTF {<feat tag>} {<>true code>} {<>false code>}
	Check if the raw OpenType <feature tag> is available in the current font with script and language settings as set up when the font was loaded.
<u>\fontspec_if_feature:nnnTF</u>	\fontspec_if_feature:nnnTF {<script tag>} {<lang tag>} {<feat tag>} {<>true code>} {<>false code>}
	\fontspec_if_feature:nTF {latn} {ROM} {pnum} {True} {False}
	Test whether the currently selected font with raw OpenType <script tag> and raw OpenType <language tag> contains the raw OpenType <feature tag>. Returns false if the font is not loaded by fontspec or is not an OpenType font.
<u>\fontspec_if_script:nTF</u>	\fontspec_if_script:nTF {<script tag>} {<>true code>} {<>false code>}
	\fontspec_if_script:nTF {latn} {True} {False}
	Test whether the currently selected font contains the raw OpenType <script tag>. Returns false if the font is not loaded by fontspec or is not an OpenType font.
<u>\fontspec_if_language:nTF</u>	\fontspec_if_language:nTF {<lang tag>} {<>true code>} {<>false code>}
	\fontspec_if_language:nTF {ROM} {True} {False}
	Check if the raw OpenType <language tag> is available in the current font with script settings as set up when the font was loaded.
<u>\fontspec_if_language:nnTF</u>	\fontspec_if_language:nnTF {<script tag>} {<lang tag>} {<>true code>} {<>false code>}
	\fontspec_if_language:nnTF {cyr1} {SRB} {True} {False}
	Test whether the currently selected font contains the raw OpenType <language tag> in <script tag>. Returns false if the font is not loaded by fontspec or is not an OpenType font.
<u>\fontspec_if_current_script:nTF</u>	\fontspec_if_current_script:nTF {<script tag>} {<>true code>} {<>false code>}
	Test whether the currently loaded font has been loaded with the specified raw OpenType <script tag>.
<u>\fontspec_if_current_language:nTF</u>	\fontspec_if_current_language:nTF {<lang tag>} {<>true code>} {<>false code>}
	Test whether the currently loaded font has been loaded with the specified raw OpenType <language tag>.
<u>\fontspec_if_current_feature:nTF</u>	\fontspec_if_current_feature:nTF {<feat tag>} {<>true code>} {<>false code>}
	Test whether the currently loaded font is using the specified raw OpenType <feature tag>.
<u>\fontspec_if_small_caps:TF</u>	\fontspec_if_small_caps:TF {<>true code>} {<>false code>}
	Test whether the current font has small caps available.

### 3 Implementation

`\fontspec_if_fontspec_font:TF`

```
1 \prg_new_conditional:Nnn \fontspec_if_fontspec_font: {TF,T,F}
2   {
3     \cs_if_exist:cTF {g_@@_fontinfo_ \f@family _prop} \prg_return_true: \prg_return_false:
4   }
```

(End of definition for `\fontspec_if_fontspec_font:TF`. This function is documented on page 36.)

`\fontspec_if_aat_feature:nnTF`

Conditional to test if the currently selected font contains the AAT feature (#1,#2).

```
5 \prg_new_conditional:Nnn \fontspec_if_aat_feature:nn {TF,T,F}
6   {
7     \fontspec_if_fontspec_font:TF
8     {
9       \@@_set_font_type:N \font
10      \bool_if:NTF \l_@@_atsui_bool
11        {
12          \@@_make_AAT_feature_string:NnnTF \font {#1} {#2}
13          \prg_return_true: \prg_return_false:
14        }
15        {
16          \prg_return_false:
17        }
18      }
19      {
20        \prg_return_false:
21      }
22    }
```

(End of definition for `\fontspec_if_aat_feature:nnTF`. This function is documented on page 36.)

`\fontspec_if_opentype:TF`

Test whether the currently selected font is an OpenType font. Always true for LuaTeX fonts.

```
23 \prg_new_conditional:Nnn \fontspec_if_opentype: {TF,T,F}
24   {
25     \fontspec_if_fontspec_font:TF
26     {
27       \@@_set_font_type:N \font
28       \bool_if:NTF \l_@@_ot_bool \prg_return_true: \prg_return_false:
29     }
30     {
31       \prg_return_false:
32     }
33   }
```

(End of definition for `\fontspec_if_opentype:TF`. This function is documented on page 36.)

`\fontspec_if_feature:nTF`

Test whether the currently selected font contains the raw OpenType feature #1. E.g.: `\fontspec_if_feature:nTF`. Returns false if the font is not loaded by fontspec or is not an OpenType font.

```
34 \prg_new_conditional:Nnn \fontspec_if_feature:n {TF,T,F}
35   {
36     \fontspec_if_fontspec_font:TF
```

```

37     {
38     \@@_set_font_type:N \font
39     \bool_if:NTF \l_@@_ot_bool
40     {
41     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {script-num} \l_@@_tmp_tl
42     \int_set:Nn \l_@@_script_int {\l_@@_tmp_tl}
43
44     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {lang-num} \l_@@_tmp_tl
45     \int_set:Nn \l_@@_language_int {\l_@@_tmp_tl}
46
47     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {script-tag} \l_@@_script_tl
48     \prop_get:cnN {g_@@_fontinfo_ \f@family _prop} {lang-tag} \l_@@_lang_tl
49
50     \@@_check_ot_feat:NnnnTF \font {#1} {\l_@@_lang_tl} {\l_@@_script_tl} {\prg_return
51     }
52     {
53     \prg_return_false:
54     }
55     }
56     {
57     \prg_return_false:
58     }
59     }

```

(End of definition for `\fontspec_if_feature:nTF`. This function is documented on page 37.)

`\fontspec_if_feature:nnnTF` #1 : script tag  
#2 : language tag  
#3 : feature tag

```

60 \prg_new_conditional:Nnn \fontspec_if_feature:nnn {TF,T,F}
61 {
62   \fontspec_if_fontspec_font:TF
63   {
64     \@@_set_font_type:N \font
65     \bool_if:NTF \l_@@_ot_bool
66     {
67       \@@_check_ot_feat:NnnnTF \font {#3} {#2} {#1} \prg_return_true: \prg_return_false:
68     }
69     { \prg_return_false: }
70   }
71   { \prg_return_false: }
72 }

```

(End of definition for `\fontspec_if_feature:nnnTF`. This function is documented on page 37.)

`\fontspec_if_script:nTF` #1 : script tag

```

73 \prg_new_conditional:Nnn \fontspec_if_script:n {TF,T,F}
74 {
75   \fontspec_if_fontspec_font:TF
76   {
77     \@@_set_font_type:N \font
78     \bool_if:NTF \l_@@_ot_bool

```

```

79     {
80     \@@_check_script:NnTF \font {#1} \prg_return_true: \prg_return_false:
81     }
82     { \prg_return_false: }
83   }
84   { \prg_return_false: }
85 }

```

*(End of definition for \fontspec\_if\_script:nTF. This function is documented on page 37.)*

**\fontspec\_if\_language:nTF** #1 : lang tag

```

86 \prg_new_conditional:Nnn \fontspec_if_language:n {TF,T,F}
87 {
88   \fontspec_if_fontspec_font:TF
89   {
90     \@@_set_font_type:N \font
91     \bool_if:NTF \l_@@_ot_bool
92     {
93       \prop_get:cnN {g_@@_fontinfo_ \f@family_prop} {script-num} \l_@@_tmp_tl
94       \int_set:Nn \l_@@_script_int {\l_@@_tmp_tl}
95       \prop_get:cnN {g_@@_fontinfo_ \f@family_prop} {script-tag} \l_@@_script_tl
96
97       \@@_check_lang:NnTF \font {#1} \prg_return_true: \prg_return_false:
98     }
99     { \prg_return_false: }
100   }
101   { \prg_return_false: }
102 }

```

*(End of definition for \fontspec\_if\_language:nTF. This function is documented on page 37.)*

**\fontspec\_if\_language:nnTF** #1 : script tag  
#2 : lang tag

```

103 \prg_new_conditional:Nnn \fontspec_if_language:nn {TF,T,F}
104 {
105   \fontspec_if_fontspec_font:TF
106   {
107     \@@_set_font_type:N \font
108     \bool_if:NTF \l_@@_ot_bool
109     {
110       \@@_check_lang:NnnTF \font {#2} {#1} \prg_return_true: \prg_return_false:
111     }
112     { \prg_return_false: }
113   }
114   { \prg_return_false: }
115 }

```

*(End of definition for \fontspec\_if\_language:nnTF. This function is documented on page 37.)*

**\fontspec\_if\_current\_script:nTF** #1 : script tag

```

116 \prg_new_conditional:Nnn \fontspec_if_current_script:n {TF,T,F}
117 {

```



```

118 \fontspec_if_fontspec_font:TF
119 {
120   \@@_set_font_type:N \font
121   \bool_if:NTF \l_@@_ot_bool
122   {
123     \prop_get:cnN {g_@@_fontinfo_ \f@family_prop} {script-tag} \l_@@_tmp_tl
124     \str_if_eq:nVTF {#1} \l_@@_tmp_tl
125     {\prg_return_true:} {\prg_return_false:}
126   }
127   { \prg_return_false: }
128 }
129 { \prg_return_false: }
130 }

```

(End of definition for `\fontspec_if_current_script:nTF`. This function is documented on page 37.)

`\fontspec_if_current_language:nTF` #1 : lang tag

```

131 \prg_new_conditional:Nnn \fontspec_if_current_language:n {TF,T,F}
132 {
133   \fontspec_if_fontspec_font:TF
134   {
135     \@@_set_font_type:N \font
136     \bool_if:NTF \l_@@_ot_bool
137     {
138       \prop_get:cnN {g_@@_fontinfo_ \f@family_prop} {lang-tag} \l_@@_tmp_tl
139       \str_if_eq:nVTF {#1} \l_@@_tmp_tl
140       {\prg_return_true:} {\prg_return_false:}
141     }
142     { \prg_return_false: }
143   }
144   { \prg_return_false: }
145 }

```

(End of definition for `\fontspec_if_current_language:nTF`. This function is documented on page 37.)

`\fontspec_gset_family:Nnn` #1 : family

`\fontspec_set_family:Nnn` #2 : fontspec features

#3 : font

```

146 \cs_new:Nn \@@_tl_new_if_free:N { \tl_if_exist:NF #1 { \tl_new:N #1 } }
147 \cs_new:Nn \@@_set_family:NnnN
148 {
149   <debug>\typeout{::::::~~fontspec_set_family:Nnn}
150   \tl_set:Nn \l_@@_fontface_cs_tl {\l_fontspec_font} % reset
151   \tl_set:Nn \l_@@_family_label_tl {#1}
152   \@@_select_font_family:nn {#2} {#3}
153   \@@_tl_new_if_free:N #1
154   #4 #1 \l_fontspec_family_tl
155   \tl_set:Nn \l_@@_fontface_cs_tl {\l_fontspec_font} % reset
156   <debug>\typeout{::::::~~END~fontspec_set_family:Nnn}
157 }
158 \cs_new:Nn \fontspec_gset_family:Nnn { \@@_set_family:NnnN #1 {#2} {#3} \tl_gset_eq:NN }
159 \cs_new:Nn \fontspec_set_family:Nnn { \@@_set_family:NnnN #1 {#2} {#3} \tl_set_eq:NN }

```

```
160 \cs_generate_variant:Nn \fontspec_set_family:Nnn {c}
```

(End of definition for `\fontspec_gset_family:Nnn` and `\fontspec_set_family:Nnn`. These functions are documented on page 36.)

`\fontspec_gset_fontface:NNnn` `\fontspec_set_fontface:NNnn` **TODO:** the round-about approach of using `\fontname` means that settings such as `fontdimens` will be lost. (Discovered in `unicode-math`.) Investigate!

```
161 \tl_new:N \l_@@_fontface_cs_tl
162 \tl_set:Nn \l_@@_fontface_cs_tl {\l_fontspec_font}
163 \cs_new:Nn \@@_set_fontface:NNnnN
```

```
{
164   \tl_set:Nn \l_@@_fontface_cs_tl {#1}
165   \tl_set:Nn \l_@@_family_label_tl {#2}
166   \@@_select_font_family:nn {#3} {#4}
167   #5 #2 \l_fontspec_family_tl
168   \tl_set:Nn \l_@@_fontface_cs_tl {\l_fontspec_font} % reset
169 }
170 }
```

```
171 \cs_new:Nn \fontspec_gset_fontface:NNnn { \@@_set_fontface:NNnnN #1 #2 {#3} {#4} \tl_gset_eq:NN}
172 \cs_new:Nn \fontspec_set_fontface:NNnn { \@@_set_fontface:NNnnN #1 #2 {#3} {#4} \tl_set_eq:NN}
```

(End of definition for `\fontspec_gset_fontface:NNnn` and `\fontspec_set_fontface:NNnn`. These functions are documented on page 36.)

`\fontspec_font_if_exist:nTF`

```
173 \prg_new_conditional:Nnn \fontspec_font_if_exist:n {TF,T,F}
174 {
175   \group_begin:
176   \@@_init:
177   \@@_if_detect_external:nT {#1} { \@@_font_is_file: }
178   \@@_primitive_font_if_exist:nTF { \@@_construct_font_call:nn {#1} {} }
179   { \group_end: \prg_return_true: }
180   { \group_end: \prg_return_false: }
181 }
```

```
182 \cs_set_eq:NN \IfFontExistsTF \fontspec_font_if_exist:nTF
```

(End of definition for `\fontspec_font_if_exist:nTF`. This function is documented on page 36.)

`\fontspec_if_current_feature:nTF` **#1** : feat tag

```
183 \prg_new_conditional:Nnn \fontspec_if_current_feature:n {TF,T,F}
184 {
185   <debug>\typeout{::~~fontspec_if_current_feature:n~{#1}}
186   <debug>\typeout{::::~~primitive_font_current_name::~~\@@_primitive_font_current_name:}
187   \exp_args:Nxx \tl_if_in:nnTF
188   { \@@_primitive_font_current_name: } { \tl_to_str:n {#1} }
189   { \prg_return_true: } { \prg_return_false: }
190 }
```

(End of definition for `\fontspec_if_current_feature:nTF`. This function is documented on page 37.)

`\fontspec_if_small_caps:TF`

```
191 \prg_new_conditional:Nnn \fontspec_if_small_caps: {TF,T,F}
192 {
193   \@@_if_merge_shape:nTF {sc}
194   {
195     \tl_set_eq:Nc \l_@@_smcp_shape_tl { \@@_shape_merge:nn {\f@shape} {sc} }
196   }
197   {
198     \tl_set:Nn \l_@@_smcp_shape_tl {sc}
199   }
200
201   \cs_if_exist:cTF { \f@encoding/\f@family/\f@series/\l_@@_smcp_shape_tl }
202   {
203     \tl_if_eq:ccTF
204     { \f@encoding/\f@family/\f@series/\l_@@_smcp_shape_tl }
205     { \f@encoding/\f@family/\f@series/\shapedefault }
206     { \prg_return_false: }
207     { \prg_return_true: }
208   }
209   { \prg_return_false: }
210 }
```

*(End of definition for `\fontspec_if_small_caps:TF`. This function is documented on page 37.)*

## File X

# fontspec-code-internal.dtx

## 1 Internals

### 1.1 The main function for setting fonts

`\@@_select_font_family:nn` This is the command that defines font families for use, the underlying procedure of all `\fontspec`-like commands. Given a list of font features (`#1`) for a requested font (`#2`), it will define an NFSS family for that font and put the family name (globally) into `\l_fontspec_family_tl`. The TeX `\font` command is (globally) stored in `\l_fontspec_font`.

This macro does its processing inside a group to attempt to restrict the scope of its internal processing. This works to some degree to insulate the internal commands from having to be manually cleared.

Some often-used variables to know about:

- `\l_fontspec_fontname_tl` is used as the generic name of the font being defined.
- `\l_@@_fontid_tl` is the unique identifier of the font with all its features.
- `\l_@@_fontname_up_tl` is the font specifically to be used as the upright font.
- `\l_@@_basename_tl` is the (immutable) original argument used for `*`-replacing.
- `\l_fontspec_font` is the plain TeX font of the upright font requested.

```
1 \cs_new_protected:Nn \@@_select_font_family:nn
2 {
3 <debug>\typeout{^^J^^J::::::::::::::::::::::::::::::::::::::::^^J:: fontspec_select:nn~ {#1}~ {#2} }
4   \group_begin:
5   \@@_font_suppress_not_found_error:
6   \@@_init:
7
8   \@@_sanitise_fontname:Nn \l_fontspec_fontname_tl {#2}
9   \tl_set_eq:NN \l_@@_fontname_up_tl \l_fontspec_fontname_tl
10  \tl_set_eq:NN \l_@@_basename_tl \l_fontspec_fontname_tl
11
12 <debug>\typeout{^^J::::::::::::::::::::::::: l_fontspec_fontname_tl~ =~ \l_fontspec_fontname_tl }
13
14   \@@_if_detect_external:nT {#2}
15   { \keys_set:nn {fontspec-prepare-external} {Path} }
16
17   \keys_set_known:nn {fontspec-prepare-cfg} {#1}
18
19   \@@_init_ttc:n {#2}
20   \@@_load_external_fontoptions:N \l_fontspec_fontname_tl
21
22   \@@_extract_all_features:n {#1}
23   \tl_set:Nx \l_@@_fontid_tl { \tl_to_str:N \l_fontspec_fontname_tl-:\tl_to_str:N \l_@@_all
24
25 <debug>\typeout{fontid: \l_@@_fontid_tl}
```

```

26
27   \@@_preparse_features:
28
29   (debug)\typeout{^^J:::::::::::::::::: l_fontspec_fontname_tl~ =~ \l_fontspec_fontname_tl }
30   (debug)\typeout{:::::::::::::::::: _fontname_up_tl~ =~ \l_@@_fontname_up_tl }
31   (debug)\typeout{:::::::::::::::::: l_@@_extension_tl~ =~ \l_@@_extension_tl }
32
33   \@@_load_font:
34   \@@_set_scriptlang:
35   \@@_get_features:n {}
36   \bool_set_false:N \l_@@_firsttime_bool
37
38   \@@_save_family_needed:nTF {#2}
39   {
40     \@@_save_family:nn {#1} {#2}
41   (debug)\@@_warning:nxx {defining-font} {#1} {#2}
42   }
43   {
44   (debug)\typeout{Font~ family~ already~ defined.}
45   }
46   \group_end:
47
48   \tl_set_eq:NN \l_fontspec_family_tl \g_@@_nfss_family_tl
49   (debug)\typeout{::::::::::::::::::}
50   }

```

(End of definition for \@@\_select\_font\_family:nn. This function is documented on page ??.)

\fontspec\_select:nn This old name has been used by 3rd party packages so for compatibility:

```

51 \cs_set_eq:NN \fontspec_select:nn \@@_select_font_family:nn %% deprecated, for compatibility of

```

(End of definition for \fontspec\_select:nn. This function is documented on page ??.)

\@@\_sanitise\_fontname:Nn Assigns font name #2 to token list variable #1 and strips extension(s) from it in the case of an external font.

```

52 \cs_new:Nn \@@_sanitise_fontname:Nn
53 {
54   \tl_set:Nx #1 {#2}
55   \tl_trim_spaces:N #1
56   \@@_process_ext:N #1
57 }
58
59 \cs_new:Nn \@@_process_ext:N
60 {
61   \clist_map_inline:Nn \l_@@_extensions_clist
62   {
63     \tl_if_in:NnT #1 {##1}
64     {
65   (debug) \typeout{::@@_process_ext:N~ --- Removing~ EXT:~ ##1}
66     \tl_remove_once:Nn #1 {##1}
67     \tl_set:Nn \l_@@_extension_tl {##1}
68     \@@_font_is_file:

```

```

69         \clist_map_break:
70     }
71 }
72 }

```

(End of definition for \@@\_sanitise\_fontname:Nn. This function is documented on page ??.)

\@@\_if\_detect\_external:nT Check if either the fontname ends with a known font extension.

```

73 \prg_new_conditional:Nnn \@@_if_detect_external:n {T}
74 {
75 (debug) \typeout{:: @@_if_detect_external:n { \exp_not:n {#1} } }
76 \clist_map_inline:Nn \l_@@_extensions_clist
77 {
78 \bool_set_false:N \l_@@_tmpa_bool
79 \exp_args:Nx % <- this should be handled earlier
80 \tl_if_in:nnT {#1 <= end_of_string} {##1 <= end_of_string}
81 { \bool_set_true:N \l_@@_tmpa_bool \clist_map_break: }
82 }
83 \bool_if:NTF \l_@@_tmpa_bool \prg_return_true: \prg_return_false:
84 }

```

(End of definition for \@@\_if\_detect\_external:nT. This function is documented on page ??.)

\@@\_init\_ttc:n For TTC fonts we assume they will be loading the italic/bold fonts from the same file, so prepopulate the fontnames to avoid needing to do it manually.

```

85 \cs_new:Nn \@@_init_ttc:n
86 {
87 \str_if_eq:eeT { \str_lowercase:f {\l_@@_extension_tl} } {.ttc}
88 {
89 \tl_set_eq:NN \l_@@_fontname_it_tl \l_fontspec_fontname_tl
90 \tl_set_eq:NN \l_@@_fontname_bf_tl \l_fontspec_fontname_tl
91 \tl_set_eq:NN \l_@@_fontname_bfit_tl \l_fontspec_fontname_tl
92 }
93 }

```

(End of definition for \@@\_init\_ttc:n. This function is documented on page ??.)

\@@\_load\_external\_fontoptions:N Load a possible .fontspec font configuration file. This file could set font-specific options for the font about to be loaded. The parameter should be a token list containing a sanitised fontname. In the past this used a space-stripped version of the name, so we check for the file both with and without spaces to load it.

```

94 \cs_new:Nn \@@_load_external_fontoptions:N
95 {
96 \bool_if:NT \l_@@_fontcfg_bool
97 {
98 (debug) \typeout{:: @@_load_external_fontoptions:N \exp_not:N #1 }
99 \tl_set:Nx \l_@@_ext_filename_tl {#1.fontspec}
100 \tl_remove_all:Nn \l_@@_ext_filename_tl {-}
101 \prop_if_in:NVF \g_@@_fontopts_prop #1
102 {
103 \exp_args:No \file_if_exist:nTF { \l_@@_ext_filename_tl }
104 {

```

```

1105         \file_input:n { \l_@@_ext_filename_tl }
1106     }
1107     {
1108         \tl_remove_all:Nn \l_@@_ext_filename_tl {~}
1109         \exp_args:No \file_if_exist:nT { \l_@@_ext_filename_tl }
1110         { \file_input:n { \l_@@_ext_filename_tl } }
1111     }
1112 }
1113 }
1114 }

```

*(End of definition for \@@\_load\_external\_fontoptions:N. This function is documented on page ??.)*

**\@@\_extract\_all\_features:**

```

1115 \cs_new:Nn \@@_extract_all_features:n
1116 {
1117 (debug) \typeout{: : @@_extract_all_features:n { \unexpanded {#1} } }
1118     \bool_if:NTF \l_@@_disable_defaults_bool
1119     {
1120         \clist_set:Nx \l_@@_all_features_clist {#1}
1121     }
1122     {
1123         \prop_get:NVNF \g_@@_fontopts_prop \l_fontspec_fontname_tl \l_@@_fontopts_clist
1124         { \clist_clear:N \l_@@_fontopts_clist }
1125
1126         \prop_get:NVNF \g_@@_fontopts_prop \l_@@_family_label_tl \l_@@_family_fontopts_clist
1127         { \clist_clear:N \l_@@_family_fontopts_clist }
1128         \tl_clear:N \l_@@_family_label_tl
1129
1130         \clist_set:Nx \l_@@_all_features_clist
1131         {
1132             \g_@@_default_fontopts_clist,
1133             \l_@@_family_fontopts_clist,
1134             \l_@@_fontopts_clist,
1135             #1
1136         }
1137     }
1138 }

```

*(End of definition for \@@\_extract\_all\_features:. This function is documented on page ??.)*

**\@@\_preparse\_features:** #1 : feature options

#2 : font name

Perform the (multi-step) feature parsing process.

Convert the requested features to font definition strings. First the features are parsed for information about font loading (whether it's a named font or external font, etc.), and then information is extracted for the names of the other shape fonts.

```

1139 \cs_new:Nn \@@_preparse_features:
1140 {
1141 (debug) \typeout{: : @@_preparse_features:}

```

Detect if external fonts are to be used, possibly automatically, and parse fontspec features for bold/italic fonts and their features.

```

142
143 \@@_keys_set_known:nxN {fontspec-prepare-external}
144   { \l_@@_all_features_clist }
145   \l_@@_keys_leftover_clist
146

```

When `\l_fontspec_fontname_tl` is augmented with a prefix or whatever to create the name of the upright font (`\l_@@_fontname_up_tl`), this latter is the new 'general font name' to use.

```

147 \tl_set_eq:NN \l_fontspec_fontname_tl \l_@@_fontname_up_tl
148 \@@_keys_set_known:nxN {fontspec-renderer} {\l_@@_keys_leftover_clist}
149   \l_@@_keys_leftover_clist
150 \@@_keys_set_known:nxN {fontspec-prepare} {\l_@@_keys_leftover_clist}
151   \l_@@_fontfeat_clist
152 }

```

(End of definition for `\@@_prepare_features:`. This function is documented on page ??.)

`\@@_load_font:`

```

153 \cs_new:Nn \@@_load_font:
154   {
155   <debug>\typeout{:: @@_load_font}
156
157   \@@_sanitise_fontname:Nn \l_@@_fontname_up_tl { \l_@@_fontname_up_tl }
158 <debug>\typeout{Set~ base~ font~ for~ preliminary~ analysis:~ "\l_@@_fontname_up_tl"~ with~ fe
159   \@@_primitive_font_set:NnnF \l_@@_test_font
160   { \@@_construct_font_call:nn { \l_@@_fontname_up_tl } { \l_@@_pre_feat_sclist } }
161   { \f@size pt - 2sp }
162   { \@@_error:nx {font-not-found} {\l_@@_fontname_up_tl} }
163
164 <debug>\typeout{Set~ base~ font~ properly: \@@_construct_font_call:nn { \l_@@_fontname_up_tl }
165   \@@_set_font_type:N \l_@@_test_font
166   \@@_primitive_font_gset:0nn \l_@@_fontface_cs_tl
167   { \@@_construct_font_call:nn { \l_@@_fontname_up_tl } { \l_@@_pre_feat_sclist } }
168   { \f@size pt + 2sp }
169
170   \l_@@_fontface_cs_tl % this is necessary for LuaLaTeX to check the scripts properly
171
172   }

```

(End of definition for `\@@_load_font:`. This function is documented on page ??.)

`\@@_construct_font_call:nn` Constructs the complete font invocation. #1 : Base name

#2 : Extension  
 #3 : TTC Index  
 #4 : Renderer  
 #5 : Optical size  
 #6 : Font features

We check if *<Font features>* are empty and if so don't add in the separator colon.

```

173 \cs_new:Nn \@@_construct_font_call:nnnnnn
174   {

```



```

175 (XE) " \@@_fontname_wrap:n { #1 #2 #3 }
176 (LU) " \@@_fontname_wrap:n { #1 #2 } #3
177     #4 #5
178     \str_if_eq:eeF {#6}{ } {:#6} "
179 }

```

In practice, we don't use the six-argument version, since most arguments are constructed on-the-fly:

```

180 \cs_new:Nn \@@_construct_font_call:nn
181 {
182     \@@_construct_font_call:nnnnnn
183     {#1}
184     \l_@@_extension_tl
185     \l_@@_ttc_index_tl
186     \l_@@_renderer_tl
187     \l_@@_optical_size_tl
188     {#2}
189 }

```

*(End of definition for \@@\_construct\_font\_call:nn. This function is documented on page ??.)*

**\@@\_font\_is\_file:** The `\@@_fontname_wrap:n` command takes the font name and either passes it through unchanged or wraps it in the syntax for loading a font 'by filename'. For LuaTeX there are two kinds kinds of filename based loading supported: Regular filename lookups which include system fonts and lookups restricted to kpse.

```

190 \cs_new:Nn \@@_font_is_name:
191 {
192 (XE) \cs_set_eq:NN \@@_fontname_wrap:n \use:n
193 (LU) \cs_set:Npn \@@_fontname_wrap:n ##1 { name: ##1 }
194 }

```

```

195 \cs_new:Nn \@@_font_is_file:
196 {
197 (debug) \typeout{:: _font_is_file:}
198     \bool_set_true:N \l_@@_external_bool
199     \bool_lazy_and:nnTF { \l_@@_external_kpse_bool } { \tl_if_empty_p:N \l_@@_font_path_tl }
200     {
201         \cs_set:Npn \@@_fontname_wrap:n ##1 { kpse: ##1 }
202     }
203     {
204         \cs_set:Npn \@@_fontname_wrap:n ##1 { [ \l_@@_font_path_tl ##1 ] }
205     }
206 }

```

*(End of definition for \@@\_font\_is\_file: and \@@\_font\_is\_name:. These functions are documented on page ??.)*

**\@@\_set\_scriptlang:** Only necessary for OpenType fonts. First check if the font supports scripts, then apply defaults if none are explicitly requested. Similarly with the language settings.

```

207 \cs_new:Nn \@@_set_scriptlang:
208 {
209 (debug) \typeout{:: _set_scriptlang:}
210     \bool_if:NT \l_@@_firsttime_bool
211     {

```

```

212     \tl_if_empty:NF \l_@@_script_name_tl
213     {
214 (debug) \typeout{::: Script=\l_@@_script_name_tl, Language=\l_@@_lang_name_tl}
215         \keys_set:ne {fontspec-opentype} {Script=\l_@@_script_name_tl}
216         \keys_set:ne {fontspec-opentype} {Language=\l_@@_lang_name_tl}
217     }
218 }
219 }

```

*(End of definition for \@@\_set\_scriptlang:. This function is documented on page ??.)*

**\@@\_get\_features:Nn** This macro is a wrapper for `\keys_set:n` which expands and adds a default specification to the original passed options. It begins by initialising the commands used to hold font-feature specific strings. Its argument is any additional features to prepend to the default.

Do not set the colour if not explicitly spec'd else `\color` (using specials) will not work.

```

220 \cs_new:Nn \@@_get_features:n
221 {
222 (debug) \typeout{:: @@@_get_features:Nn { \exp_not:n {#1} } }
223     \@@_init_fontface:
224     \@@_keys_set_known:nxN {fontspec-renderer} {\l_@@_fontfeat_clist,#1}
225     \l_@@_keys_leftover_clist
226     \@@_keys_set_known:nxN {fontspec} {\l_@@_keys_leftover_clist} \l_@@_keys_leftover_clist
227 (*XE)
228     \bool_if:NTF \l_@@_ot_bool
229     {
230 (debug) \typeout{::: Setting~ keys~ for~ OpenType~ font~ features:~"\l_@@_keys_leftover_clist
231         \keys_set_known:nV {fontspec-opentype} \l_@@_keys_leftover_clist
232     }
233     {
234 (debug) \typeout{::: Setting~ keys~ for~ AAT/Graphite~ font~ features:~"\l_@@_keys_leftover_c
235         \bool_if:nT { \l_@@_atsui_bool || \l_@@_graphite_bool }
236         { \keys_set_known:nV {fontspec-aat} \l_@@_keys_leftover_clist }
237     }
238 (/XE)
239 (*LU)
240 (debug) \typeout{::: Setting~ keys~ for~ OpenType~ font~ features:~"\l_@@_keys_leftover_clist
241         \keys_set_known:nV {fontspec-opentype} \l_@@_keys_leftover_clist
242 (/LU)
243
244     \tl_if_empty:NF \l_@@_mapping_tl
245     { \@@_update_featstr:n { mapping = \l_@@_mapping_tl } }
246
247     \str_if_eq:eeF { \l_@@_hexcol_tl \l_@@_opacity_tl }
248     { \c_@@_hexcol_tl \c_@@_opacity_tl }
249 (XE)     { \@@_update_featstr:n { color = \l_@@_hexcol_tl\l_@@_opacity_tl } }
250 (LU)     { \@@_update_featstr:n { color = {\l_@@_hexcol_tl\l_@@_opacity_tl} } }
251 }

```

*(End of definition for \@@\_get\_features:Nn. This function is documented on page ??.)*

**\@@\_save\_family\_needed:nTF** Check if the family is unique and, if so, save its information. (`\addfontfeature` and other macros use this data.) Then the font family and its shapes are defined in the NFSS.

Now we have a unique (in fact, too unique!) string that contains the family name and every option in abbreviated form. This is used with a counter to create a simple NFSS family name for the font we're selecting.

```

252 \prg_new_conditional:Nnn \@@_save_family_needed:n { TF }
253 {
254
255 (debug) \typeout{save~ family:~ #1}
256 (debug) \typeout{== fontid_tl: "\l_@@_fontid_tl".}
257
258 \tl_if_empty:NTF \l_@@_nfss_fam_tl
259 {
260   \prop_get:NVNTF \g_@@_fontid_family_prop \l_@@_fontid_tl \l_@@_tmp_tl
261   {
262     \tl_gset_eq:NN \g_@@_nfss_family_tl \l_@@_tmp_tl
263     \prg_return_false:
264   }
265   {
266     \tl_set:Nx \l_@@_tmp_tl {#1}
267     \tl_remove_all:Nn \l_@@_tmp_tl { ~ }
268     \@@_save_fontid_family:VV \l_@@_fontid_tl \l_@@_tmp_tl
269     \prg_return_true:
270   }
271 }
272 {
273   \tl_gset_eq:NN \g_@@_nfss_family_tl \l_@@_nfss_fam_tl
274   \cs_undefine:c { g_@@_fontinfo_ \g_@@_nfss_family_tl _prop }
275   \prg_return_true:
276 }
277 }
278 \cs_new:Nn \@@_save_fontid_family:nn
279 {
280   \prop_get:NnNTF \g_@@_family_int_prop {#2} \l_@@_tmp_tl
281   {
282     \tl_set:Nx \l_@@_tmp_tl
283     { \int_eval:n { \l_@@_tmp_tl + 1 } }
284   }
285   { \tl_set:Nn \l_@@_tmp_tl { 0 } }
286   \prop_gput:NnV \g_@@_family_int_prop {#2} \l_@@_tmp_tl
287   \tl_gset:Nx \g_@@_nfss_family_tl { #2 ( \l_@@_tmp_tl ) }
288   \prop_gput:NnV \g_@@_fontid_family_prop {#1} \g_@@_nfss_family_tl
289 }
290 \cs_generate_variant:Nn \@@_save_fontid_family:nn { VV }

```

*(End of definition for \@@\_save\_family\_needed:nTF. This function is documented on page ??.)*

`\@@_save_family:nn` Saves the relevant font information for future processing.

```

291 \cs_new:Nn \@@_save_family:nn
292 {
293   \@@_save_fontinfo:n {#2}
294   \@@_find_autofonts:
295   \DeclareFontFamily{\g_@@_nfss_enc_tl}{\g_@@_nfss_family_tl}{

```

```

296 \@@_set_faces:
297 \@@_info:nxx {defining-font} {#1} {#2}
298 }

```

*(End of definition for \@@\_save\_family:nn. This function is documented on page ??.)*

**\@@\_save\_fontinfo:n** Saves the relevant font information for future processing.

```

299 \cs_new:Nn \@@_save_fontinfo:n
300 {
301   \prop_new:c {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop}
302   \prop_gput:cnx {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {fontname} { #1 }
303   \prop_gput:cnx {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {options} { \l_@@_all_features }
304   \prop_gput:cnx {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {fontdef}
305   {
306     \@@_construct_font_call:nn {\l_fontspeg_fontname_tl}
307     { \l_@@_pre_feat_sclist \g_@@_rawfeatures_sclist \@@_get_variations: }
308   }
309   \prop_gput:cnV {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {script-num} \l_@@_script_int
310   \prop_gput:cnV {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {lang-num} \l_@@_language_int
311   \prop_gput:cnV {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {script-tag} \l_@@_script_tl
312   \prop_gput:cnV {g_@@_fontinfo_ \g_@@_nfss_family_tl _prop} {lang-tag} \l_@@_lang_tl
313 }

```

*(End of definition for \@@\_save\_fontinfo:n. This function is documented on page ??.)*

## 1.2 Setting font shapes in a family

All NFSS specifications take their default values, so if any of them are redefined, the shapes will be selected to fit in with the current state. For example, if `\bfdefault` is redefined to `b`, all bold shapes defined by this package will also be assigned to `b`.

The combination shapes are searched first because they use information that may be redefined in the single cases. E.g., if no bold font is specified then `set_autofont` will attempt to set it. This has subtle/small ramifications on the logic of choosing the bold italic font.

**\@@\_find\_autofonts:**

```

314 \cs_new:Nn \@@_find_autofonts:
315 {
316   \bool_if:nF {\l_@@_noit_bool || \l_@@_nobf_bool}
317   {
318     \@@_set_autofont:Nnn \l_@@_fontname_bfit_tl {\l_@@_fontname_it_tl} {/B}
319     \@@_set_autofont:Nnn \l_@@_fontname_bfit_tl {\l_@@_fontname_bf_tl} {/I}
320     \@@_set_autofont:Nnn \l_@@_fontname_bfit_tl {\l_fontspeg_fontname_tl} {/BI}
321   }
322
323   \bool_if:NF \l_@@_nobf_bool
324   {
325     \@@_set_autofont:Nnn \l_@@_fontname_bf_tl {\l_fontspeg_fontname_tl} {/B}
326   }
327
328   \bool_if:NF \l_@@_noit_bool
329   {

```

```

330     \@@_set_autofont:Nnn \l_@@_fontname_it_tl {\l_fontspeg_fontname_tl} {/I}
331   }
332
333   \@@_set_autofont:Nnn \l_@@_fontname_bfsl_tl {\l_@@_fontname_sl_tl} {/B}
334 }

```

*(End of definition for \@@\_find\_autofonts:. This function is documented on page ??.)*

**\@@\_set\_faces:**

```

335 \cs_new:Nn \@@_set_faces:
336 {
337   \@@_add_nfssfont:nmmm \mddefault \shapedefault \l_fontspeg_fontname_tl \l_@@_fontfeat_up_c
338   \@@_add_nfssfont:nmmm \bfdefault \shapedefault \l_@@_fontname_bf_tl \l_@@_fontfeat_bf_c
339   \@@_add_nfssfont:nmmm \mddefault \itdefault \l_@@_fontname_it_tl \l_@@_fontfeat_it_c
340   \@@_add_nfssfont:nmmm \mddefault \sldefault \l_@@_fontname_sl_tl \l_@@_fontfeat_sl_c
341   \@@_add_nfssfont:nmmm \mddefault \swdefault \l_@@_fontname_sw_tl \l_@@_fontfeat_sw_c
342   \@@_add_nfssfont:nmmm \bfdefault \itdefault \l_@@_fontname_bfit_tl \l_@@_fontfeat_bfit
343   \@@_add_nfssfont:nmmm \bfdefault \sldefault \l_@@_fontname_bfsl_tl \l_@@_fontfeat_bfsl
344   \@@_add_nfssfont:nmmm \bfdefault \swdefault \l_@@_fontname_bfsw_tl \l_@@_fontfeat_bfsw
345   \prop_map_inline:Nn \l_@@_nfssfont_prop { \@@_set_faces_aux:nmmmm ##2 }
346 }
347 \cs_new:Nn \@@_set_faces_aux:nmmmm
348 {
349 (debug) \typeout{: : \@@_set_faces_aux:nmmmm \exp_not:n { #1 } { #2 } { #3 } { #4 } { #5 } } }
350   \fontspec_complete_fontname:Nn \l_@@_curr_fontname_tl { #3 }
351   \@@_make_font_shapes:Nmmmm \l_@@_curr_fontname_tl { #1 } { #2 } { #4 } { #5 }
352 }

```

*(End of definition for \@@\_set\_faces:. This function is documented on page ??.)*

**\fontspec\_complete\_fontname:Nn** This macro defines #1 as the input with any \* tokens of its input replaced by the font name. This lets us define supplementary fonts in full ("Baskerville Semibold") or in abbreviation ("\* Semibold").

```

353 \cs_new:Nn \fontspec_complete_fontname:Nn
354 {
355   \tl_set:Nx #1 { #2 }
356   \tl_if_in:NnF \l_fontspeg_fontname_tl { * }
357   {
358     \tl_replace_all:Nne #1 { * } {\l_@@_basename_tl}
359   }
360 }

```

*(End of definition for \fontspec\_complete\_fontname:Nn. This function is documented on page ??.)*

**\@@\_add\_nfssfont:nmmmm** #1 : series  
#2 : shape  
#3 : fontname  
#4 : fontspec features

```

361 \cs_new:Nn \@@_add_nfssfont:nmmmm
362 {
363   \tl_set:Nx \l_@@_this_font_tl { #3 }

```

```

364
365 \tl_if_empty:eTF {#4}
366 { \clist_set:Nn \l_@@_sizefeat_clist {Size={-}} }
367 { \@@_keys_set_known:nxN {fontspec-preparse-nested} {#4} \l_@@_tmp_tl }
368
369 \tl_if_empty:NF \l_@@_this_font_tl
370 {
371   \prop_put:Nee \l_@@_nfssfont_prop {#1/#2}
372   { {#1}{#2}{\l_@@_this_font_tl}{#4}{\l_@@_sizefeat_clist} }
373 }
374 }

```

(End of definition for \@@\_add\_nfssfont:nnnn. This function is documented on page ??.)

### 1.2.1 Fonts

\@@\_set\_font\_type:N Now check if the font is to be rendered with `ATSUI` or `Harfbuzz`. This will either be automatic (based on the font type), or specified by the user via a font feature.

This macro sets booleans accordingly depending if the font in `\l_fontspectestfont` is an AAT font or an OpenType font or a font with feature axes (either AAT or Multiple Master), respectively.

```

375 \cs_new:Nn \@@_set_font_type:N
376 {
377   <debug> \typeout{:: @@@_set_font_type:}
378   <*XE>
379   \bool_set_false:N \l_@@_tfm_bool
380   \bool_set_false:N \l_@@_atsui_bool
381   \bool_set_false:N \l_@@_ot_bool
382   \bool_set_false:N \l_@@_mm_bool
383   \bool_set_false:N \l_@@_graphite_bool
384   \ifcase\XeTeXfonttype #1
385   <debug> \typeout{::: TFM}
386   \bool_set_true:N \l_@@_tfm_bool
387   \or
388   <debug> \typeout{::: AAT}
389   \bool_set_true:N \l_@@_atsui_bool
390   \tl_if_empty:NT \l_@@_renderer_tl { \tl_set:Nn \l_@@_renderer_tl {/AAT} }
391   \ifnum\XeTeXcountvariations #1 > 0\relax
392   <debug> \typeout{::: MM}
393   \bool_set_true:N \l_@@_mm_bool
394   \fi
395   \or
396   <debug> \typeout{::: OpenType}
397   \bool_set_true:N \l_@@_ot_bool
398   \tl_if_empty:NT \l_@@_renderer_tl { \tl_set:Nn \l_@@_renderer_tl {/OT} }
399   \or
400   <debug> \typeout{::: Graphite}
401   \bool_set_true:N \l_@@_graphite_bool
402   \tl_if_empty:NT \l_@@_renderer_tl { \tl_set:Nn \l_@@_renderer_tl {/GR} }
403   \fi
404   </XE>

```

If automatic, the `\l_@@_renderer_tl` token list will still be empty (other suffices that could be added will be later in the feature processing), and if it is indeed still empty, assign it a value so that the other weights of the font are specifically loaded with the same renderer.

LuaTeX only supports one:

```

405 <*LU>
406     \bool_set_true:N \l_@@_ot_bool
407 </LU>
408 }

```

*(End of definition for `\@@_set_font_type:N`. This function is documented on page ??.)*

```

\@@_set_autofont:Nnn #1 : Font name tl
                    #2 : Base font name
                    #3 : Font name modifier

```

This function looks for font with `<name>` and `<modifier>` #2#3, and if found (i.e., different to font with name #2) stores it in tl #1. A modifier is something like /B to look for a bold font, for example.

We can't match external fonts in this way (in X<sub>Y</sub>TeX anyway; todo: test with LuaTeX). If `<font name tl>` is not empty, then it's already been specified by the user so abort. If `<Base font name>` is not given, we also abort for obvious reasons.

If `<font name tl>` is empty, then proceed. If not found, `<font name tl>` remains empty. Otherwise, we have a match.

```

409 \cs_new:Nn \@@_set_autofont:Nnn
410 {
411     \bool_if:NF \l_@@_external_bool
412     {
413         \tl_if_empty:eF {#2}
414         {
415             \tl_if_empty:NT #1
416             {
417                 \@@_if_autofont:nnTF {#2} {#3}
418                 { \tl_set:Nx #1 {#2#3} }
419                 { \@@_info:nx {no-font-shape} {#2#3} }
420             }
421         }
422     }
423 }
424 \prg_new_conditional:Nnn \@@_if_autofont:nn {T,TF}
425 {
426     \group_begin:
427     \@@_primitive_font_set:Nnn \l_@@_tmpa_font { \@@_construct_font_call:nn {#1} { \l_@@_pre
428     \@@_primitive_font_set:Nnn \l_@@_tmpb_font { \@@_construct_font_call:nn {#1#2} { \l_@@_pre
429     \cs_if_eq:NNTF \l_@@_tmpa_font \l_@@_tmpb_font
430     { \group_end: \prg_return_false: }
431     { \group_end: \prg_return_true: }
432 }

```

*(End of definition for `\@@_set_autofont:Nnn`. This function is documented on page ??.)*

`\@@_make_font_shapes:Nnnnn` #1 : Font name  
 #2 : Font series  
 #3 : Font shape  
 #4 : Font features  
 #5 : Size features

This macro eventually uses `\DeclareFontShape` to define the font shape in question.

```

433 \cs_new:Nn \@@_make_font_shapes:Nnnnn
434   {
435     \group_begin:
436     \@@_keys_set_known:nxN {fontspec-preparse-external} { #4 } \l_@@_leftover_clist
437     \@@_load_fontname:Nn \l_fontspeg_fontname_tl {#1}
438     \@@_declare_shape:nxxx {#2} {#3} { \l_@@_fontopts_clist, \l_@@_leftover_clist } {#5}
439     \group_end:
440   }

441 \cs_new:Nn \@@_load_fontname:Nn
442   {
443   <debug> \typeout{: : \@@_load_fontname:Nn \exp_not:N #1 (#1) {#2} }
444     \@@_sanitise_fontname:Nn #1 {#2}
445     \@@_load_external_fontoptions:N #1
446     \prop_get:NVNF \g_@@_fontopts_prop #1 \l_@@_fontopts_clist
447     { \clist_clear:N \l_@@_fontopts_clist }
448     \keys_set_groups:nnV {fontspec/fontname} {getfontname} \l_@@_fontopts_clist
449     \@@_primitive_font_set:OnnF \l_@@_fontface_cs_tl
450     { \@@_construct_font_call:nn {#1} { \l_@@_pre_feat_sclist } } { \f@size pt + 2sp }
451     { \@@_error:nx {font-not-found} {#2} }
452   }

453 \keys_define:nn {fontspec/fontname}
454   {
455     Font .tl_set:N = \l_fontspeg_fontname_tl ,
456     Font .groups:n = {getfontname} ,
457   }

```

*(End of definition for `\@@_make_font_shapes:Nnnnn`. This function is documented on page ??.)*

`\@@_declare_shape:nnnn` #1 : Font series  
 #2 : Font shape  
 #3 : Font features  
 #4 : Size features

Wrapper for `\DeclareFontShape`. And finally the actual font shape declaration using `\l_@@_nfss_tl` defined above. `\l_@@_postadjust_tl` is defined in various places to deal with things like the hyphenation character and interword spacing.

The main part is to loop through `SizeFeatures` arguments, which are of the form  
`SizeFeatures={{<one>},{<two>},{<three>}}`.

```

458 \cs_new:Nn \@@_declare_shape:nnnn
459   {
460   <debug>\typeout{=~ declare_shape:~{\l_fontspeg_fontname_tl}~{#1}~{#2}}
461     \tl_build_begin:N \l_@@_nfss_tl
462     \tl_build_begin:N \l_@@_nfss_sc_tl
463     \tl_set_eq:NN \l_@@_saved_fontname_tl \l_fontspeg_fontname_tl

```



```

464
465 \exp_args:Nx \clist_map_inline:nn {#4} { \@@_setup_single_size:nn {#3} {##1} }
466
467 \tl_build_end:N \l_@@_nfss_tl
468 \tl_build_end:N \l_@@_nfss_sc_tl
469
470 \@@_declare_shapes_normal:nn {#1} {#2}
471 \@@_declare_shapes_smcaps:nn {#1} {#2}
472 \@@_declare_shape_slanted:nn {#1} {#2}
473 \@@_declare_shapes_bx:nn {#1} {#2}
474 \@@_declare_shape_loginfo:nn {#1} {#2}
475 }
476 \cs_generate_variant:Nn \@@_declare_shape:nnnn {nnxx}

```

*(End of definition for \@@\_declare\_shape:nnnn. This function is documented on page ??.)*

\@@\_setup\_single\_size:nn

```

477 \cs_new:Nn \@@_setup_single_size:nn
478 {
479   \tl_clear:N \l_@@_size_tl
480   \tl_set_eq:NN \l_@@_sizedfont_tl \l_@@_saved_fontname_tl % in case not spec'ed
481
482   \keys_set_known:neN {fontspec-sizing} { \exp_after:wN \use:n #2 }
483   \l_@@_sizing_leftover_clist
484   \tl_if_empty:NT \l_@@_size_tl { \@@_error:n {no-size-info} }
485   <debug>\typeout{==~ size:~\l_@@_size_tl}
486
487   % "normal"
488   \@@_load_fontname:Nn \l_fontspec_fontname_tl {\l_@@_sizedfont_tl}
489   \@@_setup_nfss:Nn \l_@@_nfss_tl { #1 , \l_@@_sizing_leftover_clist }
490   <debug> \typeout{===~ sized~ font:~ \l_@@_sizedfont_tl}
491
492   % small caps
493   \clist_set_eq:NN \l_@@_fontfeat_curr_clist \l_@@_fontfeat_sc_clist
494
495   \bool_if:NF \l_@@_nosc_bool
496   {
497     \tl_if_empty:NTF \l_@@_fontname_sc_tl
498     {
499       \@@_make_smallcaps:TF
500       {
501         <debug>\typeout{====~Small~ caps~ found.}
502         \clist_put_left:Nn \l_@@_fontfeat_curr_clist {Letters=SmallCaps}
503       }
504       {
505         <debug>\typeout{====~Small~ caps~ not~ found.}
506         \bool_set_true:N \l_@@_nosc_bool
507       }
508     }
509     { \@@_load_fontname:Nn \l_fontspec_fontname_tl {\l_@@_fontname_sc_tl} }% local for e
510   }

```

```

511
512     \bool_if:NF \l_@@_nosc_bool
513     {
514         \@@_setup_nfss:Nn \l_@@_nfss_sc_tl
515         {#1 , \l_@@_sizing_leftover_clist , \l_@@_fontfeat_curr_clist}
516     }
517 }

```

*(End of definition for \@@\_setup\_single\_size:nn. This function is documented on page ??.)*

**\@@\_setup\_nfss:Nn**

```

518 \cs_new:Nn \@@_setup_nfss:Nn
519 {
520 (debug)\typeout{====~Setup~NFSS~shape:~<\l_@@_size_tl>~\l_fontspeg_fontname_tl}
521 (debug)\typeout{====~Requested~features:~#2}
522
523     \@@_get_features:n { #2 }
524
525 (debug)\typeout{====~Gathered~features:~\g_@@_rawfeatures_sclist \@@_get_variations:}
526
527     \tl_if_empty:NF \l_@@_scale_tl
528     {
529         \tl_set:Nx \l_@@_scale_tl { s*[\l_@@_scale_tl] }
530     }
531
532     \tl_build_put_right:Nx #1
533     {
534         <\l_@@_size_tl> \l_@@_scale_tl
535         \@@_construct_font_call:nn { \l_fontspeg_fontname_tl }
536         { \l_@@_pre_feat_sclist \g_@@_rawfeatures_sclist \@@_get_variations: }
537     }
538 }

```

*(End of definition for \@@\_setup\_nfss:Nn. This function is documented on page ??.)*

**\@@\_declare\_shapes\_normal:nn**

```

539 \cs_new:Nn \@@_declare_shapes_normal:nn
540 {
541     \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl} {\g_@@_nfss_family_tl}
542     {#1} {#2} {\l_@@_nfss_tl}{\l_@@_postadjust_tl}
543 }

```

*(End of definition for \@@\_declare\_shapes\_normal:nn. This function is documented on page ??.)*

**\@@\_declare\_shapes\_smcaps:nn**

```

544 \cs_new:Nn \@@_declare_shapes_smcaps:nn
545 {
546     \tl_if_empty:NF \l_@@_nfss_sc_tl
547     {
548         \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl} {\g_@@_nfss_family_tl} {#1}
549         { \@@_combo_sc_shape:n {#2} } {\l_@@_nfss_sc_tl} {\l_@@_postadjust_tl}
550     }
551 }

```

```

552 \cs_new:Nn \@@_combo_sc_shape:n
553 {
554   \tl_if_exist:cTF { \@@_shape_merge:nn {#1} {\scdefault} }
555     { \tl_use:c { \@@_shape_merge:nn {#1} {\scdefault} } }
556     { \scdefault#1 }
557 }

```

(End of definition for \@@\_declare\_shapes\_smcaps:nn. This function is documented on page ??.)

\@@\_DeclareFontShape:nnnnnn

```

558 \cs_new:Nn \@@_DeclareFontShape:nnnnnn
559 {
560 (debug)\typeout{DeclareFontShape:~{#1}{#2}{#3}{#4}...}
561 \group_begin:
562 \normalsize
563 \cs_undefine:c {#1/#2/#3/#4/\f@size}
564 \group_end:
565 \DeclareFontShape{#1}{#2}{#3}{#4}{#5}{#6}
566 }
567 \cs_generate_variant:Nn \@@_DeclareFontShape:nnnnnn {xxxxxx}

```

This extra stuff for the slanted shape substitution is a little bit awkward. We define the slanted shape to be a synonym for it when (a) we're defining an italic font, but also (b) when the default slanted shape isn't 'it'. (Presumably this turned up once in a test and I realised it caused problems. I doubt this would happen much.)

We should test when a slanted font has been specified and not run this code if so, but the \@@\_set\_slanted: code will overwrite this anyway if necessary.

```

568 \cs_new:Nn \@@_declare_shape_slanted:nn
569 {
570   \bool_if:nT
571     {
572       \str_if_eq_p:ee {#2} {\itdefault} &&
573       !(\str_if_eq_p:ee {\itdefault} {\sldefault})
574     }
575     {
576       \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl}{\g_@@_nfss_family_tl}{#1}{\sldefault}
577         {<->ssub*\g_@@_nfss_family_tl/#1/\itdefault}{\l_@@_postadjust_tl}
578     }
579 }

```

Similar processing for setting up b/bx substitutions.

```

\@@_declare_shapes_bx:nn 580 \cs_new:Nn \@@_declare_shapes_bx:nn
581 {
582   \bool_if:nT
583     {
584       \str_if_eq_p:ee {#1} {\bfdefault} &&
585       !(\str_if_eq_p:ee {\bfdefault} {bx})
586     }
587     {
588       % bx/?
589       \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl} {\g_@@_nfss_family_tl}

```

```

590     {bx} {#2}
591     { <->ssub*\g_@@_nfss_family_tl/\bfdefault/#2 }
592     { \l_@@_postadjust_tl }
593
594 % bx/sc -> b/sc
595 \tl_if_empty:NF \l_@@_nfss_sc_tl
596 {
597     \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl} {\g_@@_nfss_family_tl}
598     {bx} { \@@_combo_sc_shape:n {#2} }
599     { <->ssub*\g_@@_nfss_family_tl/\bfdefault/#2 }
600     { \l_@@_postadjust_tl }
601 }
602
603 % bx/sl -> bx/it
604 \bool_if:nT
605 {
606     \str_if_eq_p:ee {#2} {\itdefault} &&
607     !(\str_if_eq_p:ee {\itdefault} {\sldefault})
608 }
609 {
610     \@@_DeclareFontShape:xxxxxx {\g_@@_nfss_enc_tl} {\g_@@_nfss_family_tl}
611     {bx} {\sldefault}
612     { <->ssub*\g_@@_nfss_family_tl/bx/\itdefault }
613     { \l_@@_postadjust_tl }
614 }
615 }
616 }
617 }

```

Lastly some informative messaging.

```

\@@_declare_shape_loginfo:nn 618 \cs_new:Nn \@@_declare_shape_loginfo:nn
619 {
620     \tl_gput_right:Nx \g_@@_defined_shapes_tl
621     {
622         \exp_not:n { \ }
623         -- \exp_not:N \str_case:nn {#1/#2}
624         {
625             {\mddefault/\shapedefault} {'normal'~}
626             {\bfdefault/\shapedefault} {'bold'~}
627             {\mddefault/\itdefault} {'italic'~}
628             {\mddefault/\sldefault} {'slanted'~}
629             {\mddefault/\swdefault} {'swash'~}
630             {\bfdefault/\itdefault} {'bold- italic'~}
631             {\bfdefault/\sldefault} {'bold- slanted'~}
632             {\bfdefault/\swdefault} {'bold- swash'~}
633         } (#1/#2)~
634         with~ NFSS~ spec.:~
635         \l_@@_nfss_tl
636         \tl_if_empty:NF \l_@@_nfss_sc_tl
637         {
638             \exp_not:n { \ }
639             -- \exp_not:N \str_case:nn { #1 / \@@_combo_sc_shape:n {#2} }

```

```

640     {
641       {\mddefault/\scdefault} {'small~ caps'~}
642       {\bfdefault/\scdefault} {'bold~ small~ caps'~}
643       {\mddefault/\scitdefault} {'italic~ small~ caps'~}
644       {\bfdefault/\scitdefault} {'bold~ italic~ small~ caps'~}
645       {\mddefault/\scsldefault} {'slanted~ small~ caps'~}
646       {\bfdefault/\scsldefault} {'bold~ slanted~ small~ caps'~}
647     }~( #1 / \@_combo_sc_shape:n {#2} )~
648     with~ NFSS~ spec.:~
649     \l_@@_nfss_sc_tl
650     \tl_if_empty:fF {\l_@@_postadjust_tl}
651     {
652       \exp_not:N \ and~ font~ adjustment~ code:
653       \exp_not:N \ \l_@@_postadjust_tl
654     }
655   }
656 }
657 }

```

Maybe `\str_if_eq:eeF` would be better?

### 1.2.2 Features

These are the features always applied to a font selection before other features.

```

\l_@@_pre_feat_sclist 658 \tl_set:Nn \l_@@_pre_feat_sclist
659 (*XE)
660 {
661   \bool_if:NT \l_@@_ot_bool
662   {
663     \tl_if_empty:NF \l_@@_script_tl { script = \l_@@_script_tl ; }
664     \tl_if_empty:NF \l_@@_lang_tl { language = \l_@@_lang_tl ; }
665   }
666 }
667 </XE>
668 (*LU)
669 {
670   mode = \l_@@_mode_tl ;
671   \tl_if_empty:NF \l_@@_shaper_tl { shaper = \l_@@_shaper_tl ; }
672   \tl_if_empty:NF \l_@@_script_tl { script = \l_@@_script_tl ; }
673   \tl_if_empty:NF \l_@@_lang_tl { language = \l_@@_lang_tl ; }
674 }
675 </LU>

```

This macro checks if the font contains small caps.

```

\@@_make_smallcaps:TF 676 \cs_new:Nn \@@_make_ot_smallcaps:TF
\@@_make_ot_smallcaps:TF 677 {
678   \bool_set_false:N \l_@@_tmpa_bool
679   \exp_args:Ne \clist_map_inline:nn { \l_@@_lang_tl , \g_@@_default_langs_clist }
680   {
681     \exp_args:Ne \clist_map_inline:nn { \l_@@_script_tl , \g_@@_default_scripts_clist }
682     {
683       \exp_args:No \@@_check_ot_feat:NnnnT \l_@@_fontface_cs_tl {smcp} {##1} {###1}

```

```

684         {
685 <debug>\typeout{SMCP~found~for~script/lang: ####1/#1~~~assuming~okay}
686         \bool_set_true:N \l_@@_tmpa_bool
687         \clist_map_break:
688         }
689     }
690 }
691 \bool_if:NTF \l_@@_tmpa_bool {#1} {#2}
692 }
693 \cs_new:Nn \@@_make_smallcaps:TF
694 {
695     \bool_if:NTF \l_@@_ot_bool
696     { \@@_make_ot_smallcaps:TF {#1} {#2} }
697     {
698         \bool_if:NT \l_@@_atsui_bool
699         {
700             \exp_args:No \@@_make_AAT_feature_string:NnnTF
701             \l_@@_fontface_cs_tl {3} {3} {#1} {#2}
702         }
703     }
704 }

```

\g\_@@\_rawfeatures\_sclist is the string used to define the list of specific font features. Each time another font feature is requested, this macro is used to add that feature to the list. Font features are separated by semicolons.

```

\@@_update_featstr:n
705 \cs_new:Nn \@@_update_featstr:n
706 {
707 <debug> \typeout{::: @@_update_featstr:n {#1}}
708     \bool_if:NF \l_@@_firsttime_bool
709     {
710         \tl_gset:Nx \g_@@_single_feat_tl { #1 }
711 <debug> \typeout{:::~ Adding~ feature.}
712         \tl_gput_right:Nx \g_@@_rawfeatures_sclist {#1;}
713     }
714 }

```

```

\@@_remove_clashing_featstr:n
715 \cs_new:Nn \@@_remove_clashing_featstr:n
716 {
717 <debug> \typeout{::: @@_remove_clashing_featstr:n {#1}}
718     \clist_map_inline:nn {#1}
719     {
720 <debug> \typeout{:::~ Removing~ feature~ "##1;}
721         \tl_gremove_all:Nn \g_@@_rawfeatures_sclist {##1;}
722     }
723 }
724 \cs_generate_variant:Nn \@@_remove_clashing_featstr:n {x}

```

\@@\_get\_variations: builds the feature string representing the current variation instance and/or axis settings.

```

725 \cs_generate_variant:Nn \tl_tail:n { e }

```

```

726 \cs_new:Nn \@@_format_axis:nn
727 {
728   , #1 = #2
729 }
730 \cs_new:Nn \@@_get_variations:
731 {
732   \tl_if_empty:NF \g_@@_instance_tl
733   {
734     instance = { \g_@@_instance_tl };
735   }
736   \prop_if_empty:NF \g_@@_rawvariations_prop
737   {
738     axis = {
739       \tl_tail:e {
740         \prop_map_function:NN \g_@@_rawvariations_prop \@@_format_axis:nn
741       }
742     };
743   }
744 }

```

### 1.3 Initialisation

Initialisations that need to occur once per fontspec font invocation. (Some of these may be \@@\_init: redundant. Check whether they're assigned to globally or not.)

```

745 \cs_set:Npn \@@_init:
746 {
747   (debug) \typeout{:: @@_init:}
748   \bool_set_false:N \l_@@_ot_bool
749   \bool_set_true:N \l_@@_firsttime_bool
750   \@@_font_is_name:
751   \tl_clear:N \l_@@_font_path_tl
752   \tl_clear:N \l_@@_optical_size_tl
753   \tl_clear:N \l_@@_ttc_index_tl
754   \tl_clear:N \l_@@_renderer_tl
755   \tl_gclear:N \g_@@_defined_shapes_tl
756   \tl_gclear:N \g_@@_curr_series_tl
757   \tl_gset_eq:NN \g_@@_nfss_enc_tl \g_fontspec_encoding_tl
758   (*LU)
759   \tl_set:Nn \l_@@_mode_tl {node}
760   (/LU)
761 }

```

Executed in \@@\_get\_features:Nn.

```

\@@_init_fontface: 762 \cs_new:Nn \@@_init_fontface:
763 {
764   \tl_gclear:N \g_@@_rawfeatures_sclist
765   \prop_gclear:N \g_@@_rawvariations_prop
766   \tl_gclear:N \g_@@_instance_tl
767   \tl_clear:N \l_@@_scale_tl
768   \tl_set_eq:NN \l_@@_opacity_tl \c_@@_opacity_tl
769   \tl_set_eq:NN \l_@@_hexcol_tl \c_@@_hexcol_tl

```

```

770 \tl_set_eq:NN \l_@@_postadjust_tl \c_@@_postadjust_tl
771 \tl_clear:N \l_@@_wordspace_adjust_tl
772 \tl_clear:N \l_@@_punctspace_adjust_tl
773 }

```

## 1.4 Miscellaneous

This macro takes an OpenType tag and validates it.

```

\@@_ot_validate_tag:n 774 (*LU)
775 \cs_new_protected:Nn \@@_ot_validate_tag:n
776 {
777   \@@_ot_validate_tag:w #1 \q_nil
778 }
779 \cs_generate_variant:Nn \@@_ot_validate_tag:n {x}
780 \cs_set:Npn \@@_ot_validate_tag:w #1 #2 \q_nil
781 {
782   \bool_if:nTF { \str_if_eq_p:nn {#1} {+} || \str_if_eq_p:nn {#1} {-} }
783     { \@@_ot_validate_tag_aux:w #2 \c_empty_tl \c_empty_tl \q_nil }
784     { \@@_ot_validate_tag_aux:w #1#2 \c_empty_tl \c_empty_tl \q_nil }
785 }
786 \cs_set:Npn \@@_ot_validate_tag_aux:w #1#2#3#4#5 \q_nil
787 {
788   \int_compare:nT { \tl_count:n {#5} > 2 }
789     { \@@_error:nx {ot-tag-too-long} {#1#2#3#4#5} }
790 }
791 </LU>

```

`\@@_iv_str_to_num:Nn` This macro takes a four character string and converts it to the numerical representation required for X<sub>Y</sub>TeX OpenType script/language/feature purposes. The output is stored in #1.

This code is not used in LuaTeX, as the checking for that engine is done via Lua code provided by luaotfload.

```

792 (*XE)
793 \cs_new:Nn \@@_iv_str_to_num:Nn
794 {
795   (debug)\typeout{\_iv_str_to_num:~#1~/~#2}
796   \@@_strip_leading_sign:Nw #1#2 \q_nil
797 }
798 \cs_generate_variant:Nn \@@_iv_str_to_num:Nn {Nx}

```

The input can be of the form of any of these: ‘abcd’, ‘abc’, ‘abc ’, ‘ab’, ‘ab ’, etc. (It is assumed the first two chars are *always* not spaces.) So this macro reads in the string padded with \empty s, and anything beyond four chars is snipped. The \empty s then are used to reconstruct the spaces in the string to number calculation.

For backwards compatibility this code also strips a leading + or -.

```

799 \cs_set:Npn \@@_strip_leading_sign:Nw #1#2#3 \q_nil
800 {
801   \bool_if:nTF { \str_if_eq_p:nn {#2} {+} || \str_if_eq_p:nn {#2} {-} }
802     { \@@_iv_str_to_num:w #1 \q_nil #3 \c_empty_tl \c_empty_tl \q_nil }

```



```

803     { \@_iv_str_to_num:w #1 \q_nil #2#3 \c_empty_tl \c_empty_tl \q_nil }
804   }

```

If input string (after sign is stripped) is more than 4 chars, #6 will contain '*excess*\c\_empty\_tl\c\_empty\_tl'. Therefore use #6 to verify string length.

```

805 \cs_set:Npn \@_iv_str_to_num:w #1 \q_nil #2#3#4#5#6 \q_nil
806   {
807     \int_compare:nT { \tl_count:n {#6} > 2 }
808       { \@_error:nx {ot-tag-too-long} {#2#3#4#5#6} }
809
810     \int_set:Nn #1
811       {
812         `#2 * "10000000
813         + `#3 * "100000
814         + \ifx \c_empty_tl #4 32 \else `#4 \fi * "100
815         + \ifx \c_empty_tl #5 32 \else `#5 \fi
816       }
817   }
818 </XE>

```

## File XI

# fontspec-code-opentype.dtx

## 1 OpenType definitions code

```
\@@_define_opentype_variation_axis:nn 1 \cs_new:Nn \@@_define_opentype_variation_axis:nn
2 {
3   \keys_define:nn {fontspec-opentype}
4     {
5       #1 .code:n = {
6         \prop_gput:Nnn \g_@@_rawvariations_prop { #2 } { ##1 }
7       },
8       #1 .value_required:n = true,
9       #1 .groups:n = {opentype},
10    }
11 }

\@@_define_opentype_feature_group:n 12 \cs_new:Nn \@@_define_opentype_feature_group:n
13 {
14   \keys_define:nn {fontspec-opentype} { #1 .multichoice: , .groups:n = {opentype} }
15 }

#1 : Feature key
\@@_define_opentype_feature:nmnn 16 \cs_new:Nn \@@_feat_prop_add:nn
17 {
18   \tl_if_empty:nF {#1}
19   {
20     \prop_if_in:NnF \g_@@_OT_features_prop {#1}
21     {
22       \prop_gput:Nnn \g_@@_OT_features_prop {#1} {#2}
23     }
24   }
25 }

\cs_new:Nn \@@_define_opentype_feature:nmnn 26 \cs_new:Nn \@@_define_opentype_feature:nmnn
27 {
28   \@@_feat_prop_add:nn {#3} {#1\,=#, #2}
29   \tl_if_empty:nTF {#4}
30   {
31     \keys_define:nn {fontspec-opentype}
32     {
33       #1/#2 .code:n =
34       { \@@_remove_clashing_featstr:n {#5} } ,
```

```

35         #1/#2 .groups:n = {opentype}
36     }
37 }
38 {
39     \keys_define:nn {fontspec-opentype}
40     {
41         #1/#2 .code:n =
42         {
43 (debug)     \typeout{::::::::::fontspec-opentype-#1/#2-~#3/#4/#5}
44             \@@_make_OT_feature:nnn {#3} {#4} {#5}
45         } ,
46         #1/#2 .groups:n = {opentype}
47     }
48 }
49 }

```

**#1** : Feature key  
**#2** : Feature option val  
**#3** : Check feature  
**#4** : Tag prefix to activate: +#4 = on, -#4 = off.  
**#5** : Tags to remove in the on case (clist)

\@@\_define\_opentype\_onoffreset:nmnn

```

50 \cs_new:Nn \@@_feat_off:n {#10ff}
51 \cs_new:Nn \@@_feat_reset:n {#1Reset}
52 \cs_new:Nn \@@_define_opentype_onoffreset:nmnnn
53 {
54     \exp_args:Nnx \@@_define_opentype_feature:nmnnn {#1} {#2} {#3} {+#4} {#5}
55     \exp_args:Nnx \@@_define_opentype_feature:nmnnn {#1} { \@@_feat_off:n {#2} } {#3} {-#4}
56     \exp_args:Nnx \@@_define_opentype_feature:nmnnn {#1} { \@@_feat_reset:n {#2} } {} {} {+#4}
57 }

```

**#1** : Feature key  
**#2** : Feature option val  
**#3** : Check feature  
**#4** : Exact tag string to activate  
**#5** : Tags to remove (clist)

\@@\_define\_opentype\_onreset:nmnn

```

58 \cs_new:Nn \@@_define_opentype_onreset:nmnnn
59 {
60     \exp_args:Nnx \@@_define_opentype_feature:nmnnn {#1} {#2} {#3} {#4} {#5}
61     \exp_args:Nnx \@@_define_opentype_feature:nmnnn {#1} { \@@_feat_reset:n {#2} } {} {} {#4}
62 }

```

## 1.1 Adding features when loading fonts

When remove clashing features,

1. remove the feature being added (to avoid duplicates);
2. remove the inverse of the feature (to avoid cancellation);
3. finally remove all clashing features.

```

63 \cs_new:Nn \@@_make_OT_feature:nnn
64 {
65 (debug) \typeout{:: @@_make_OT_feature:nnn \exp_not:n { {#1}{#2}{#3} } }
66 \@@_remove_clashing_featstr:x { #2 , \@@_swap_plus_minus:n {#2} , #3 }
67 \@@_update_featstr:n {#2}
68 }
69 \cs_generate_variant:Nn \@@_make_OT_feature:nnn {xxx}
70 \cs_new:Nn \@@_swap_plus_minus:n { \@@_swap_plus_minus_aux:Nq #1 \q_nil }
71 \cs_new:Npn \@@_swap_plus_minus_aux:Nq #1#2 \q_nil
72 { \str_case:nn {#1} { {+} {-#2} {-} {+#2} } }

```

(End of definition for \@@\_DeclareFontShape:nnnnn and others. These functions are documented on page ??.)

`\@@_check_script:NnTF` This macro takes an OpenType script tag and checks if it exists in the current font. `\l_@@_script_int` is used to store the number corresponding to the script tag string.

```

73 \prg_new_conditional:Nnn \@@_check_script:Nn {TF,T,F}
74 {
75 (debug)\typeout{:: _check_script:Nn~#1~/~#2}
76 \bool_if:NTF \l_@@_never_check_bool
77 { \prg_return_true: }
78 {
79 \bool_if:NTF { \tl_if_empty_p:e {#2} }
80 { \prg_return_false: }
81 {
82 (*XE)
83 (debug)\typeout{:::~ checking~ script~ #2}
84 \@@_iv_str_to_num:Nx \l_@@_strnum_int {#2}
85 \int_set:Nn \l_tmpb_int { \XeTeXOTcountscripts #1 }
86 \int_zero:N \l_tmpa_int
87 \bool_set_false:N \l__fontspec_check_bool
88 \bool_until_do:nn { \int_compare_p:nNn \l_tmpa_int = \l_tmpb_int }
89 {
90 \ifnum \XeTeXOTscripttag #1 \l_tmpa_int = \l_@@_strnum_int
91 \bool_set_true:N \l__fontspec_check_bool
92 \int_set:Nn \l_tmpa_int {\l_tmpb_int}
93 \else
94 \int_incr:N \l_tmpa_int
95 \fi
96 }
97 \bool_if:NTF \l__fontspec_check_bool \prg_return_true: \prg_return_false:
98 (/XE)
99 (*LU)
100 \@@_ot_validate_tag:x {#2}
101 \cs_if_eq:NNTF #1 \font
102 { \tl_set:Nx \l_@@_tmp_tl {\curr@fontshape/\f@size} }
103 { \tl_set:Nx \l_@@_tmp_tl {\cs_to_str:N #1} }
104 (debug)\typeout{:::~ checking:~"\l_@@_tmp_tl",~ "#2"}
105 \lua_now:e { fontspec.check_ot_script("\l_@@_tmp_tl", "#2") }
106 \bool_if:NTF \l__fontspec_check_bool
107 {
108 (debug)\typeout{:::~ TRUE}

```

```

109         \prg_return_true:
110     }
111     {
112 (debug)\typeout{::::::~~ FALSE}
113         \prg_return_false:
114     }
115 </LU>
116     }
117     }
118 }

```

(End of definition for \@@\_check\_script:NnTF. This function is documented on page ??.)

\@@\_check\_lang:NnnTF This macro takes an OpenType language tag and checks if it exists in the current font/script. \l\_@@\_language\_int is used to store the number corresponding to the language tag string. The script used is whatever's held in \l\_@@\_script\_int. By default, that's the number corresponding to 'latn'.

```

119 \prg_new_conditional:Nnn \@@_check_lang:Nn {TF,F}
120 {
121     \@@_check_lang:NnnTF #1 {#2} {\l_@@_script_tl} {\prg_return_true:} {\prg_return_false:}
122 }
123 \prg_new_conditional:Nnn \@@_check_lang:Nnn {TF}
124 {
125 (debug)\typeout{:: _check_lang:Nn~#1~/~#2~/~#3~/}
126     \bool_if:NTF \l_@@_never_check_bool
127     { \prg_return_true: }
128     {
129     \bool_if:nTF { \tl_if_empty_p:e {#3} }
130     { \prg_return_false: }
131     {
132 (*XE)
133         \@@_iv_str_to_num:Nx \l_@@_strnum_int {#2}
134         \@@_iv_str_to_num:Nx \l_@@_script_int {#3}
135         \int_set:Nn \l_@@_tmpb_int
136         { \XeTeXOTcountlanguages #1 \l_@@_script_int }
137         \int_zero:N \l_@@_tmpa_int
138         \bool_set_false:N \l__fontspec_check_bool
139         \bool_until_do:nn { \int_compare_p:nNn \l_@@_tmpa_int = \l_@@_tmpb_int }
140         {
141             \int_set:Nn \l_@@_tmpc_int
142             { \XeTeXOTlanguagetag #1 \l_@@_script_int \l_@@_tmpa_int }
143
144             \int_compare:nNnTF \l_@@_tmpc_int = \l_@@_strnum_int
145             {
146                 \bool_set_true:N \l__fontspec_check_bool
147                 \int_set:Nn \l_@@_tmpa_int {\l_@@_tmpb_int}
148             }
149             {
150                 \int_incr:N \l_@@_tmpa_int
151             }
152         }
153     }
154 }

```

```

153     \bool_if:NTF \l__fontspec_check_bool \prg_return_true: \prg_return_false:
154 </XE>
155 <*LU>
156     \@@_ot_validate_tag:x {#2}
157     \@@_ot_validate_tag:x {#3}
158     \cs_if_eq:NNTF #1 \font
159       { \tl_set:Nx \l_@@_tmp_tl {\curr@fontshape/\f@size} }
160       { \tl_set:Nx \l_@@_tmp_tl {\cs_to_str:N #1} }
161     \@@_lua_function:neee {check_ot_lang} {\l_@@_tmp_tl} {#2} {#3}
162     \bool_if:NTF \l__fontspec_check_bool \prg_return_true: \prg_return_false:
163 </LU>
164   }
165 }
166 }

```

(End of definition for \@@\_check\_lang:NnnTF and \@@\_check\_lang:NnTF. These functions are documented on page ??.)

\@@\_check\_ot\_feat:NnnnTF This macro takes an OpenType feature tag and checks if it exists in the current font/script/language. \l\_@@\_strnum\_int is used to store the number corresponding to the feature tag string. The script used is whatever's held in \l\_@@\_script\_int. By default, that's the number corresponding to 'latn'. The language used is \l\_@@\_language\_int, by default 0, the 'default language'.

```

167 \prg_new_conditional:Nnn \@@_check_ot_feat:Nnnn {TF,T,F}
168 {
169   \bool_if:NTF \l_@@_never_check_bool
170     { \prg_return_true: }
171     {
172       \bool_if:NTF { \tl_if_empty_p:e {#3} || \tl_if_empty_p:e {#4} }
173         { \prg_return_false: }
174         {
175 <*XE>
176 <debug>\typeout{::~ fontspec_check_ot_feat:nnn~ {#2}{#3}{#4}}
177     \@@_iv_str_to_num:Nx \l_@@_strnum_int {#2}
178
179     \str_if_eq:eeTF {#3} {dflt}
180       { \int_zero:N \l_@@_language_int }
181       { \@@_iv_str_to_num:Nx \l_@@_language_int {#3} }
182     \@@_iv_str_to_num:Nx \l_@@_script_int {#4}
183
184     \int_set:Nn \l_tmpb_int
185       { \XeTeXOTcountfeatures #1 \l_@@_script_int \l_@@_language_int }
186
187     \int_zero:N \l_tmpa_int
188     \bool_set_false:N \l_@@_check_bool
189     \bool_until_do:nn { \int_compare_p:nNn \l_tmpa_int = \l_tmpb_int }
190     {
191       \ifnum\XeTeXOTfeaturetag #1 \l_@@_script_int \l_@@_language_int
192         \l_tmpa_int = \l_@@_strnum_int
193         \bool_set_true:N \l_@@_check_bool
194         \int_set:Nn \l_tmpa_int { \l_tmpb_int }
195       \else
196         \int_incr:N \l_tmpa_int

```

```

197         \fi
198     }
199     \bool_if:NTF \l_@@_check_bool \prg_return_true: \prg_return_false:
200 (/XE)
201 (*LU)
202 (debug)\typeout{::~~ fontspec_check_ot_feat:n~ {#1}}
203     \@@_ot_validate_tag:x {#2}
204     \@@_ot_validate_tag:x {#3}
205     \@@_ot_validate_tag:x {#4}
206     \cs_if_eq:NNTF #1 \font
207         { \tl_set:Nx \l_@@_tmp_tl {\curr@fontshape/\f@size} }
208         { \tl_set:Nx \l_@@_tmp_tl {\cs_to_str:N #1} }
209     \@@_lua_function:neeee {check_ot_feat} {\l_@@_tmp_tl} {#2} {#3} {#4}
210     \bool_if:NTF \l_@@_check_bool \prg_return_true: \prg_return_false:
211 (/LU)
212 }
213 }
214 }

```

(End of definition for \@@\_check\_ot\_feat:NnnnTF. This function is documented on page ??.)

## 1.2 OpenType feature information

```

215 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {aalt}{Access-All-Alternates}
216 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {abvf}{Above-base-Forms}
217 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {abvm}{Above-base-Mark-Positioning}
218 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {abvs}{Above-base-Substitutions}
219 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {afrc}{Alternative-Fractions}
220 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {akhn}{Akhands}
221 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {blwf}{Below-base-Forms}
222 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {blwm}{Below-base-Mark-Positioning}
223 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {blws}{Below-base-Substitutions}
224 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {calt}{Contextual-Alternates}
225 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {case}{Case-Sensitive-Forms}
226 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {ccmp}{Glyph-Composition~/~Decomposition}
227 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {cfar}{Conjunct-Form-After-Ro}
228 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {cjct}{Conjunct-Forms}
229 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {clig}{Contextual-Ligatures}
230 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {cpct}{Centered-CJK-Punctuation}
231 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {cpsp}{Capital-Spacing}
232 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {csw}{Contextual-Swash}
233 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {curs}{Cursive-Positioning}
234 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {cvNN}{Character-Variant-~$N$}
235 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {c2pc}{Petite-Capitals-From-Capitals}
236 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {c2sc}{Small-Capitals-From-Capitals}
237 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {dist}{Distances}
238 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {dlig}{Discretionary-Ligatures}
239 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {dnom}{Denominators}
240 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {dtls}{Dotless-Forms}
241 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {expt}{Expert-Forms}
242 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {falt}{Final-Glyph-on-Line-Alternates}
243 \prop_gput:Nnn \g_@@_all_opentype_feature_names_prop {fin2}{Terminal-Forms-~\#2}

```

244 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {fin3}{Terminal-Forms~\#3}  
245 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {fina}{Terminal-Forms}  
246 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {flac}{Flattened~accent~forms}  
247 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {frac}{Fractions}  
248 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {fwid}{Full~Widths}  
249 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {half}{Half~Forms}  
250 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {haln}{Halant~Forms}  
251 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {halt}{Alternate~Half~Widths}  
252 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hist}{Historical~Forms}  
253 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hkna}{Horizontal~Kana~Alternates}  
254 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hlig}{Historical~Ligatures}  
255 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hngl}{Hangul}  
256 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hojo}{Hojo~Kanji~Forms}  
257 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {hwid}{Half~Widths}  
258 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {init}{Initial~Forms}  
259 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {isol}{Isolated~Forms}  
260 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ital}{Italics}  
261 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {jalt}{Justification~Alternates}  
262 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {jp78}{JIS78~Forms}  
263 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {jp83}{JIS83~Forms}  
264 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {jp90}{JIS90~Forms}  
265 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {jp04}{JIS2004~Forms}  
266 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {kern}{Kerning}  
267 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {lfbd}{Left~Bounds}  
268 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {liga}{Standard~Ligatures}  
269 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ljmo}{Leading~Jamo~Forms}  
270 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {lnum}{Lining~Figures}  
271 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {locl}{Localized~Forms}  
272 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ltra}{Left-to-right~alternates}  
273 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ltrm}{Left-to-right~mirrored~forms}  
274 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {mark}{Mark~Positioning}  
275 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {med2}{Medial~Forms~\#2}  
276 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {medi}{Medial~Forms}  
277 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {mgrk}{Mathematical~Greek}  
278 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {mkmk}{Mark-to-Mark~Positioning}  
279 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {mset}{Mark~Positioning~via~Substitution}  
280 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {nalt}{Alternate~Annotation~Forms}  
281 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {nlck}{NLC~Kanji~Forms}  
282 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {nukt}{Nukta~Forms}  
283 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {numr}{Numerators}  
284 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {onum}{Oldstyle~Figures}  
285 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {opbd}{Optical~Bounds}  
286 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ordn}{Ordinals}  
287 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ornm}{Ornaments}  
288 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {palt}{Proportional~Alternate~Widths}  
289 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pcap}{Petite~Capitals}  
290 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pkna}{Proportional~Kana}  
291 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pnum}{Proportional~Figures}  
292 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pref}{Pre~Base~Forms}  
293 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pres}{Pre~base~Substitutions}  
294 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pstf}{Post~base~Forms}



295 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {psts}{Post-base-Substitutions}  
296 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {pwid}{Proportional-Widths}  
297 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {qwid}{Quarter-Widths}  
298 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rand}{Randomize}  
299 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rclt}{Required-Contextual-Alternates}  
300 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rkrf}{Rakar-Forms}  
301 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rlig}{Required-Ligatures}  
302 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rphf}{Reph-Forms}  
303 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rtbd}{Right-Bounds}  
304 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rtla}{Right-to-left-alternates}  
305 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rtlm}{Right-to-left-mirrored-forms}  
306 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ruby}{Ruby-Notation-Forms}  
307 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {rvrn}{Required-Variation-Alternates}  
308 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {salt}{Stylistic-Alternates}  
309 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {sinf}{Scientific-Inferiors}  
310 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {size}{Optical-size}  
311 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {smcp}{Small-Capitals}  
312 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {smpl}{Simplified-Forms}  
313 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ssNN}{Stylistic-Set- $\$N$ }  
314 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {ssty}{Math-script-style-alternates}  
315 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {stch}{Stretching-Glyph-Decomposition}  
316 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {subs}{Subscript}  
317 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {sup}{Superscript}  
318 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {swsh}{Swash}  
319 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {titl}{Titling}  
320 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {tjmo}{Trailing-Jamo-Forms}  
321 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {tnam}{Traditional-Name-Forms}  
322 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {tnum}{Tabular-Figures}  
323 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {trad}{Traditional-Forms}  
324 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {twid}{Third-Widths}  
325 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {unic}{Unicase}  
326 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {valt}{Alternate-Vertical-Metrics}  
327 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vatu}{Vattu-Variants}  
328 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vert}{Vertical-Writing}  
329 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vhal}{Alternate-Vertical-Half-Metrics}  
330 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vjmo}{Vowel-Jamo-Forms}  
331 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vkna}{Vertical-Kana-Alternates}  
332 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vkrn}{Vertical-Kerning}  
333 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vpal}{Proportional-Alternate-Vertical-Me  
334 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vrt2}{Vertical-Alternates-and-Rotation}  
335 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {vrtr}{Vertical-Alternates-for-Rotation}  
336 \prop\_gput:Nnn \g\_@@\_all\_opentype\_feature\_names\_prop {zero}{Slashed-Zero}

TODO: move the above elsewhere!!

## File XII

# fontspec-code-graphite.dtx

## 1 Graphite/AAT code

`\@@_define_aat_feature_group:n`

```
1 \cs_new:Nn \@@_define_aat_feature_group:n
2 {
3   \keys_define:nn {fontspec-aat} { #1 .multichoice: }
4 }
```

*(End of definition for \@@\_define\_aat\_feature\_group:n. This function is documented on page ??.)*

`\@@_define_aat_feature:nmnn`

```
5 \cs_new:Nn \@@_define_aat_feature:nmnn
6 {
7   \keys_define:nn {fontspec-aat}
8     {
9       #1/#2 .code:n = { \@@_make_AAT_feature:nn {#3}{#4} }
10    }
11 }
```

*(End of definition for \@@\_define\_aat\_feature:nmnn. This function is documented on page ??.)*

`\@@_make_AAT_feature:nn`

```
12 \cs_new:Nn \@@_make_AAT_feature:nn
13 {
14   \tl_if_empty:nTF {#1}
15     { \@@_warning:n {aat-feature-not-exist} }
16     {
17       \exp_args:No \@@_make_AAT_feature_string:NmnTF \l_@@_fontface_cs_tl {#1} {#2}
18       {
19         \@@_update_featstr:n {\l_fontspec_feature_string_tl}
20       }
21       {
22         \@@_warning:nx {aat-feature-not-exist-in-font} {#1,#2}
23       }
24     }
25 }
```

*(End of definition for \@@\_make\_AAT\_feature:nn. This function is documented on page ??.)*

`\@@_make_AAT_feature_string:NmnTF`

This macro takes the numerical codes for a font feature and creates a specified macro containing the string required in the font definition to turn that feature on or off. Used primarily in [...], but also used to check if small caps exists in the requested font (see page 61).

For exclusive selectors, it's easy; just grab the string: For *non*-exclusive selectors, it's a little more complex. If the selector is even, it corresponds to switching the feature on. If the selector is *odd*, it corresponds to switching the feature off. But X<sub>Y</sub>L<sub>A</sub>T<sub>E</sub>X doesn't return a selector string for this number, since the feature is defined for the 'switching on' value. So we need to

check the selector of the previous number, and then prefix the feature string with ! to denote the switch.

Finally, save out the complete feature string in `\l_fontspec_feature_string_tl`.

```

26 \prg_new_conditional:Nnn \@@_make_AAT_feature_string:Nnn {TF,T,F}
27 {
28   \tl_set:Nx \l_@@_tmpa_tl { \XeTeXfeaturename #1 #2 }
29   \tl_if_empty:NTF \l_@@_tmpa_tl
30     { \prg_return_false: }
31     {
32       \int_compare:nTF { \XeTeXisexclusivefeature #1 #2 > 0 }
33         {
34           \tl_set:Nx \l_@@_tmpb_tl { \XeTeXselectorname #1 #2\space #3}
35         }
36         {
37           \int_if_even:nTF {#3}
38             {
39               \tl_set:Nx \l_@@_tmpb_tl { \XeTeXselectorname #1 #2\space #3}
40             }
41             {
42               \tl_set:Nx \l_@@_tmpb_tl
43                 {
44                   \XeTeXselectorname #1 #2\space \numexpr#3-1\relax
45                 }
46               \tl_if_empty:NF \l_@@_tmpb_tl { \tl_put_left:Nn \l_@@_tmpb_tl {!} }
47             }
48         }
49
50       \tl_if_empty:NTF \l_@@_tmpb_tl
51         { \prg_return_false: }
52         {
53           \tl_set:Nx \l_fontspec_feature_string_tl { \l_@@_tmpa_tl = \l_@@_tmpb_tl }
54           \prg_return_true:
55         }
56     }
57 }

```

*(End of definition for `\@@_make_AAT_feature_string:NnnTF`. This function is documented on page ??.)*

## File XIII

# fontspec-code-keyval.dtx

## 1 Font loading (keyval) definitions

This package uses a large number of keyval modules which operate sequentially on keyval input to ensure priority.

```
1 \clist_gset:Nn \g_@@_all_keyval_modules_clist
2 {
3   fontspec, fontspec-opentype, fontspec-aat,
4   fontspec-preparse, fontspec-preparse-cfg, fontspec-preparse-external, fontspec-preparse-ne
5   fontspec-renderer
6 }
```

Wrapper function to save some characters in the source:

```
7 \cs_new:Nn \@@_keys_define_code:nnn
8 {
9   \keys_define:nn {#1} { #2 .code:n = {#3} }
10 }
```

For catching features that cannot be used in `\addfontfeatures`:

```
11 \cs_new:Nn \@@_aff_error:n
12 {
13   \@@_keys_define_code:nnn {fontspec-addfontfeatures} {#1}
14   { \@@_error:nx {not-in-addfontfeatures} {#1} }
15 }
```

### 1.1 Pre-pre-parsing stages

These features are extracted from the font feature list before all others.

#### Don't load font config file

```
16 \@@_keys_define_code:nnn {fontspec-preparse-cfg} {IgnoreFontspecFile}
17 {
18   \bool_set_false:N \l_@@_fontcfg_bool
19 }
20 \@@_keys_define_code:nnn {fontspec-preparse-external} {IgnoreFontspecFile}
21 {
22   \bool_set_false:N \l_@@_fontcfg_bool
23 }
```

**Path** For fonts that aren't installed in the system. If no argument is given, the font is located with `kpsewhich`; it's either in the current directory or the  $\TeX$  tree. Otherwise, the argument given defines the file path of the font.

```
24 \@@_keys_define_code:nnn {fontspec-preparse-external} {Path}
25 {
26   \bool_set_true:N \l_@@_nobf_bool
27   \bool_set_true:N \l_@@_noit_bool
28   \tl_set:Nn \l_@@_font_path_tl {#1}
```

```

29     \@@_font_is_file:
30     (*XE)
31     \keys_set:nn {fontspec-renderer} {Renderer=OpenType}
32     (/XE)
33     }
34     \aliasfontfeature{Path}{ExternalLocation}
35     \@@_keys_define_code:nnn {fontspec} {Path} {}

```

(End of definition for Path. This function is documented on page ??.)

**Extension** For fonts that aren't installed in the system. Specifies the font extension to use.

```

36 \@@_keys_define_code:nnn {fontspec-prepare-external} {Extension}
37   {
38     \tl_set:Nn \l_@@_extension_tl {#1}
39     \bool_if:NF \l_@@_external_bool
40     {
41       \keys_set:nn {fontspec-prepare-external} {Path}
42     }
43   }
44   \tl_clear:N \l_@@_extension_tl
45   \@@_keys_define_code:nnn {fontspec} {Extension} {}

```

**KpseOnly** If the font is specified by filename, only search for it through kpse. Xe<sub>La</sub>TeX does not support finding system fonts by filename so this is always implicitly set there.

```

46 \@@_keys_define_code:nnn {fontspec-prepare-external} {KpseOnly}
47   {
48     \bool_set_true:N \l_@@_external_kpse_bool
49     \bool_if:NT \l_@@_external_bool \@@_font_is_file:
50   }
51   \@@_keys_define_code:nnn {fontspec} {KpseOnly} {}

```

**Renderer** This feature must be processed before all others (the other font shape and features options are also pre-parsed for convenience) because the renderer determines the format of the features and whether certain features are available.

```

52 (*XE)
53 \keys_define:nn {fontspec-renderer}
54   {
55     Renderer .choices:nn =
56     {AAT,ICU,OpenType,Graphite,Full,Basic,Node,Base,HarfBuzz,Harfbuzz}
57     {
58       \int_compare:nTF {\l_keys_choice_int <= 4}
59       {
60         \tl_set:Nx \l_@@_renderer_tl
61         {
62           \int_case:nn \l_keys_choice_int { 1 {/AAT} 2 {/OT} 3 {/OT} 4 {/GR} }
63         }
64         (debug)\typeout{Renderer:~ \l_@@_renderer_tl}
65         \tl_gset:Nx \g_@@_single_feat_tl { \l_@@_renderer_tl }
66       }
67     }

```

```

68         \@@_warning:nx {only-luatex-feature} {Renderer=Full/Basic/Node/Base/HarfBuzz}
69     }
70 }
71 }
72 </XE>
73 <*LU>
74 \keys_define:nn {fontspec-renderer}
75 {
76     Renderer .choices:nn =
77     {Full,Node,Basic,Base,HarfBuzz,Harfbuzz,OpenType,AAT,Graphite}
78     {
79         \int_compare:nT {\l_keys_choice_int >= 5} { \bool_set_true:N \l_@@_harfbuzz_bool }
80
81         \tl_set:Nx \l_@@_mode_tl
82         {
83             \int_case:nn \l_keys_choice_int { 1 {node} 2 {node} 3 {base} 4 {base} 5 {harf} 6 {
84             }
85
86             \tl_set:Nx \l_@@_shaper_tl
87             {
88                 \int_case:nn \l_keys_choice_int { 1 {} 2 {} 3 {} 4 {} 5 {} 6 {} 7 {ot} 8 {coretext}
89             }
90
91 <debug>\typeout{Mode:~"\l_@@_mode_tl"~/~Shaper:~"\l_@@_shaper_tl"}
92
93         \tl_gset:Nx \g_@@_single_feat_tl
94         {
95             mode=\l_@@_mode_tl ;
96             \tl_if_empty:NF \l_@@_shaper_tl { shaper=\l_@@_shaper_tl}
97         }
98     } ,
99
100     Renderer unknown .code:n =
101     {
102         \bool_set_true:N \l_@@_harfbuzz_bool
103         \@@_warning:nx {unknown-renderer} {#1}
104         \tl_set:Nn \l_@@_mode_tl {harf}
105         \tl_set:Nn \l_@@_shaper_tl {#1}
106     } ,
107 }
108 </LU>

```

## 1.2 Pre-parsed features

**OpenType script/language** See later for the resolutions from fontspec features to OpenType definitions.

```

109 \@@_keys_define_code:nnn {fontspec-prepare} {Script}
110 {
111 <XE>     \tl_if_empty:NT \l_@@_renderer_tl { \keys_set:nn {fontspec-renderer} {Renderer=OpenType}
112         \tl_set:Nn \l_@@_script_name_tl {#1}
113     }

```

Exactly the same:

```
114 \@@_keys_define_code:nmn {fontspec-prepare} {Language}
115 {
116 (XE) \tl_if_empty:NT \l_@@_renderer_tl { \keys_set:nn {fontspec-renderer} {Renderer=OpenType}
117 \tl_set:Nn \l_@@_lang_name_tl {#1}
118 }
```

### TTC font index

```
119 \@@_keys_define_code:nmn {fontspec-prepare} {FontIndex}
120 {
121 \str_if_eq:eeF { \str_lowercase:f {\l_@@_extension_tl} } {.ttc}
122 { \@@_warning:n {font-index-needs-ttc} }
123 (XE) \tl_set:Nn \l_@@_ttc_index_tl {:#1}
124 (LU) \tl_set:Nn \l_@@_ttc_index_tl {(#1)}
125 }
126 \@@_keys_define_code:nmn {fontspec} {FontIndex}
127 {
128 (XE) \tl_set:Nn \l_@@_ttc_index_tl {:#1}
129 (LU) \tl_set:Nn \l_@@_ttc_index_tl {(#1)}
130 }
```

## 1.3 Font faces

### Upright

```
131 \@@_keys_define_code:nmn {fontspec-prepare-external} {UprightFont}
132 {
133 \fontspec_complete_fontname:Nn \l_@@_fontname_up_tl {#1}
134 }
```

### Italic and slanted

```
135 \@@_keys_define_code:nmn {fontspec-prepare-external} {ItalicFont}
136 {
137 \tl_if_empty:nTF {#1}
138 {
139 \bool_set_true:N \l_@@_noit_bool
140 }
141 {
142 \bool_set_false:N \l_@@_noit_bool
143 \fontspec_complete_fontname:Nn \l_@@_fontname_it_tl {#1}
144 }
145 }
146 \@@_keys_define_code:nmn {fontspec-prepare-external} {SlantedFont}
147 {
148 \fontspec_complete_fontname:Nn \l_@@_fontname_sl_tl {#1}
149 }
150 \@@_keys_define_code:nmn {fontspec-prepare-external} {SwashFont}
151 {
152 \fontspec_complete_fontname:Nn \l_@@_fontname_sw_tl {#1}
153 }
```

**Bold (NFSS) Series** By default, fontspec uses the default bold series, `\bfdefault`. We want to be able to make this extensible. This code is not yet functional!

```

154 %\@@_keys_define_code:nmn {fontspec-prepare-external} {BoldSeries}
155 % {
156 %   \tl_gset:Nx \g_@@_curr_series_tl { #1 }
157 %   \seq_put_right:Nx \l_@@_bf_series_seq { #1 }
158 % }

```

**Bold** This contains some stubb code to allow more than one bold font to be loaded.

```

159 \@@_keys_define_code:nmn {fontspec-prepare-external} {BoldFont}
160 {
161   \tl_if_empty:nTF {#1}
162   {
163     \bool_set_true:N \l_@@_nobf_bool
164   }
165   {
166     \bool_set_false:N \l_@@_nobf_bool
167     \fontspec_complete_fontname:Nn \l_@@_curr_bfname_tl {#1}
168
169     \seq_if_empty:NT \l_@@_bf_series_seq
170     {
171       \tl_gset:Nx \g_@@_curr_series_tl {\bfdefault}
172       \seq_put_right:Nx \l_@@_bf_series_seq {\bfdefault}
173     }
174
175     \tl_if_eq:oeT \g_@@_curr_series_tl {\bfdefault}
176     {
177       \tl_set_eq:NN \l_@@_fontname_bf_tl \l_@@_curr_bfname_tl
178     }
179
180     \prop_put:NeV \l_@@_nfss_prop {BoldFont-\g_@@_curr_series_tl} \l_@@_curr_bfname_tl
181
182     <debug>\typeout{Setting-bold-font~"\l_@@_curr_bfname_tl"~with~series~"\g_@@_curr_series_tl"}
183
184   }
185 }

```

**Bold italic/slanted**

```

186 \@@_keys_define_code:nmn {fontspec-prepare-external} {BoldItalicFont}
187 {
188   \fontspec_complete_fontname:Nn \l_@@_fontname_bfit_tl {#1}
189 }
190 \@@_keys_define_code:nmn {fontspec-prepare-external} {BoldSlantedFont}
191 {
192   \fontspec_complete_fontname:Nn \l_@@_fontname_bfsl_tl {#1}
193 }
194 \@@_keys_define_code:nmn {fontspec-prepare-external} {BoldSwashFont}
195 {
196   \fontspec_complete_fontname:Nn \l_@@_fontname_bfsw_tl {#1}
197 }

```



**Small caps** Small caps isn't pre-parsed because it can vary with others above:

```

198 \@@_keys_define_code:nmn {fontspec} {SmallCapsFont}
199 {
200   \tl_if_empty:nTF {#1}
201     {
202       \bool_set_true:N \l_@@_nosc_bool
203     }
204     {
205       \bool_set_false:N \l_@@_nosc_bool
206       \fontspec_complete_fontname:Nn \l_@@_fontname_sc_tl {#1}
207     }
208 }

```

### 1.3.1 Prepared font features

```

209 \@@_keys_define_code:nmn {fontspec-preparse} {UprightFeatures}
210 {
211   \clist_put_right:Nn \l_@@_fontfeat_up_clist {#1}
212 }
213 \@@_keys_define_code:nmn {fontspec-preparse} {BoldFeatures}
214 {
215   \clist_put_right:Nn \l_@@_fontfeat_bf_clist {#1}
216 % \prop_put:NeV \l_@@_nfss_prop
217 %   {BoldFont-\g_@@_curr_series_tl} \l_@@_curr_bfname_tl
218 }
219 \@@_keys_define_code:nmn {fontspec-preparse} {ItalicFeatures}
220 {
221   \clist_put_right:Nn \l_@@_fontfeat_it_clist {#1}
222 }
223 \@@_keys_define_code:nmn {fontspec-preparse} {BoldItalicFeatures}
224 {
225   \clist_put_right:Nn \l_@@_fontfeat_bfit_clist {#1}
226 }
227 \@@_keys_define_code:nmn {fontspec-preparse} {SlantedFeatures}
228 {
229   \clist_put_right:Nn \l_@@_fontfeat_sl_clist {#1}
230 }
231 \@@_keys_define_code:nmn {fontspec-preparse} {BoldSlantedFeatures}
232 {
233   \clist_put_right:Nn \l_@@_fontfeat_bfsl_clist {#1}
234 }
235 \@@_keys_define_code:nmn {fontspec-preparse} {SwashFeatures}
236 {
237   \clist_put_right:Nn \l_@@_fontfeat_sw_clist {#1}
238 }
239 \@@_keys_define_code:nmn {fontspec-preparse} {BoldSwashFeatures}
240 {
241   \clist_put_right:Nn \l_@@_fontfeat_bfsw_clist {#1}
242 }

```

Note that small caps features can vary by shape, so these in fact *aren't* pre-parsed.

```

243 \@@_keys_define_code:nmn {fontspec} {SmallCapsFeatures}

```

```

244 {
245   \bool_if:NF \l_@@_firsttime_bool
246   {
247     \clist_put_right:Nn \l_@@_fontfeat_sc_clist {#1}
248   }
249 }

Features varying by size

250 \@@_keys_define_code:nmn {fontspec-preparse} {SizeFeatures}
251 {
252   \clist_set:Nn \l_@@_sizefeat_clist {#1}
253   \clist_put_right:Nn \l_@@_fontfeat_up_clist { SizeFeatures = {#1} }
254 }
255 \@@_keys_define_code:nmn {fontspec-preparse-nested} {SizeFeatures}
256 {
257   \clist_set:Nn \l_@@_sizefeat_clist {#1}
258   \tl_if_empty:NT \l_@@_this_font_tl
259     { \tl_set:Nn \l_@@_this_font_tl { -- } } % needs to be non-empty as a flag
260 }
261 \@@_keys_define_code:nmn {fontspec-preparse-nested} {Font}
262 {
263   \tl_set:Nn \l_@@_this_font_tl {#1}
264 }
265 \@@_keys_define_code:nmn {fontspec} {SizeFeatures}
266 {
267   % dummy
268 }
269 \@@_keys_define_code:nmn {fontspec} {Font}
270 {
271   % dummy
272 }
273 \@@_keys_define_code:nmn {fontspec-sizing} {Size}
274 {
275   \tl_set:Nn \l_@@_size_tl {#1}
276 }
277 \@@_keys_define_code:nmn {fontspec-sizing} {Font}
278 {
279   \fontspec_complete_fontname:Nn \l_@@_sizedfont_tl {#1}
280 }

  A hack to fix a test, needs to be investigated why necessary!

281 \@@_keys_define_code:nmn {fontspec-opentype} {UprightFont} {}
282 \@@_keys_define_code:nmn {fontspec-opentype} {ItalicFont} {}
283 \@@_keys_define_code:nmn {fontspec-opentype} {SlantedFont} {}
284 \@@_keys_define_code:nmn {fontspec-opentype} {BoldFont} {}
285 \@@_keys_define_code:nmn {fontspec-opentype} {BoldItalicFont} {}
286 \@@_keys_define_code:nmn {fontspec-opentype} {BoldSlantedFont} {}

```

## 1.4 General font-independent features

These features can be applied to any font.

**NFSS encoding** For the very brave.

```
287 \@@_keys_define_code:nmn {fontspec-preparse} {NFSSEncoding}
288 {
289   \tl_gset:Nx \g_@@_nfss_enc_tl { #1 }
290 }
```

**NFSS family** Interactions with other packages will sometimes require setting the NFSS family explicitly. (By default fontspec auto-generates one based on the font name.)

```
291 \@@_keys_define_code:nmn {fontspec-preparse} {NFSSFamily}
292 {
293   \tl_set:Nx \l_@@_nfss_fam_tl { #1 }
294 }
```

**NFSS series/shape** This option looks similar in name but has a very different function.

```
295 \@@_keys_define_code:nmn {fontspec-preparse} {FontFace}
296 {
297   \tl_clear:N \l_@@_this_font_tl
298   \clist_set:No \l_@@_arg_clist { \use_iii:nmn #1 }
299   \clist_set_eq:NN \l_@@_this_feat_clist \l_@@_arg_clist
300   \int_compare:nT { \clist_count:N \l_@@_arg_clist = 1 }
301   {
302     (debug)\typeout{FontFace~ parsing:~ one~ clist~ item}
303     \tl_if_in:NnF \l_@@_arg_clist {=}
304     {
305       (debug)\typeout{FontFace~ parsing:~ no~ equals~ =>~ font~ name~ only}
306       \tl_set_eq:NN \l_@@_this_font_tl \l_@@_arg_clist
307       \tl_clear:N \l_@@_this_feat_clist
308     }
309   }
310
311   \@@_add_nfssfont:nmmn
312   { \use_i:nmn #1 } { \use_ii:nmn #1 } { \l_@@_this_font_tl } { \l_@@_this_feat_clist }
313 }
```

**Scale** If the input isn't one of the pre-defined string options, then it's gotta be numerical. `\fontspec_calc_scale:n` and `\fontspec_calc_scale:nn` do all the work in the auto-scaling cases.

```
314 \@@_keys_define_code:nmn {fontspec} {Scale}
315 {
316   \str_case:nnF {#1}
317   {
318     {MatchLowercase} { \@@_calc_scale:n {5} }
319     {MatchUppercase} { \@@_calc_scale:n {8} }
320     {MatchAveragecase} { \@@_calc_scale:nn {5} {8} }
321   }
322   { \tl_set:Nx \l_@@_scale_tl {#1} }
323   \@@_info:n {set-scale}
324 }
```

## ScaleAgain

```
325 \@@_keys_define_code:nmn {fontspec} {ScaleAgain}
326 {
327   \tl_if_empty:NT \l_@@_scale_tl { \tl_set:Nn \l_@@_scale_tl {1} }
328   \tl_set:Nx \l_@@_scale_tl { \fp_eval:n { #1 * \l_@@_scale_tl } }
329   \@@_info:n {set-scale}
330 }
```

`\@@_calc_scale:n` This macro calculates the amount of scaling between the default roman font and the (default shape of) the font being selected such that the font dimension that is input is equal for both. The only font dimensions that justify this are 5 (lowercase height) and 8 (uppercase height in X<sub>Y</sub>T<sub>E</sub>X).

This script is executed for every extra shape, which seems wasteful, but allows alternate italic shapes from a separate font, say, to be loaded and to be auto-scaled correctly. Even if this would be ugly.

To begin, change to `\rmfamily` but use internal commands in case `csermfamily` has been overwritten. (Note that changing `\rmfamily` with `fontspec` resets `\encodingdefault` appropriately.)

```
331 \cs_new:Nn \@@_calc_scale:n
332 {
333   \group_begin:
334
335   \fontencoding { \encodingdefault }
336   \fontfamily { \familydefault }
337   \selectfont
338
339   \@@_set_font_dimen:NnN \l_@@_tmpa_dim {#1} \font
340   \@@_set_font_dimen:NnN \l_@@_tmpb_dim {#1} \l_@@_fontface_cs_tl
341
342   \tl_set:Nx \l_@@_scale_tl
343   {
344     \fp_eval:n { \dim_to_fp:n {\l_@@_tmpa_dim} /
345                 \dim_to_fp:n {\l_@@_tmpb_dim} }
346   }
347
348   \exp_args:NNNx
349   \group_end:
350   \tl_set:Nx \l_@@_scale_tl { \l_@@_scale_tl }
351 }
```

*(End of definition for `\@@_calc_scale:n`. This function is documented on page ??.)*

`\@@_calc_scale:mn` This macro calls `\fontspec_calc_scale:n` twice and then sets the scale to the average of the two results.

```
352 \cs_new:Nn \@@_calc_scale:mn
353 {
354   \group_begin:
355   \__fontspec_calc_scale:n {#1}
356   \tl_set_eq:NN \l_@@_tmp_tl \l_@@_scale_tl
357   \__fontspec_calc_scale:n {#2}
358   \tl_set:Nx \l_@@_scale_tl
```

```

359     {
360     \fp_eval:n { (\l_@@_tmp_tl + \l_@@_scale_tl)/2 }
361     }
362     \exp_args:NNNx
363     \group_end:
364     \tl_set:Nx \l_@@_scale_tl { \l_@@_scale_tl }
365     }

```

*(End of definition for @@\_calc\_scale:nn. This function is documented on page ??.)*

`\@@_set_font_dimen:NnN` This function sets the dimension #1 (for font #3) to 'fontdimen' #2 for either font dimension 5 (x-height) or 8 (cap-height). If, for some reason, these return an incorrect 'zero' value (as `\fontdimen8` might for a .tfm font), then we cheat and measure the height of a glyph. We assume in this case that the font contains either an 'X' or an 'x'.

```

366 \cs_new:Nn \@@_set_font_dimen:NnN
367 {
368   \dim_set:Nn #1 { \fontdimen #2 #3 }
369   \dim_compare:nNnT #1 = {0pt}
370   {
371     \settoheight #1
372     {
373       \str_if_eq:nnTF {#3} {\font} \rmfamily #3
374       \int_case:nnF #2
375       {
376         {5} {x} % x-height
377         {8} {X} % cap-height
378       } {?} % "else" clause; never reached.
379     }
380   }
381 }

```

*(End of definition for @@\_set\_font\_dimen:NnN. This function is documented on page ??.)*

**Inter-word space** These options set the relevant `\fontdimens` for the font being loaded.

```

382 \@@_keys_define_code:nnn {fontspec} {WordSpace}
383 {
384   \bool_if:NF \l_@@_firsttime_bool
385   { \_fontspec_parse_wordspace:w #1,,,\q_stop }
386 }
387 \@@_aff_error:n {WordSpace}

```

`\_fontspec_parse_wordspace:w` This macro determines if the input to `WordSpace` is of the form `{X}` or `{X,Y,Z}` and executes the font scaling. If the former input, it executes `{X,X,X}`.

```

388 \cs_set:Npn \_fontspec_parse_wordspace:w #1,#2,#3,#4 \q_stop
389 {
390   \tl_if_empty:nTF {#4}
391   {
392     \tl_set:Nn \l_@@_wordspace_adjust_tl
393     {
394       \fontdimen 2 \font = #1 \fontdimen 2 \font
395       \fontdimen 3 \font = #1 \fontdimen 3 \font

```

```

396         \fontdimen 4 \font = #1 \fontdimen 4 \font
397     }
398 }
399 {
400     \tl_set:Nn \l_@@_wordspace_adjust_tl
401     {
402         \fontdimen 2 \font = #1 \fontdimen 2 \font
403         \fontdimen 3 \font = #2 \fontdimen 3 \font
404         \fontdimen 4 \font = #3 \fontdimen 4 \font
405     }
406 }
407 }

```

(End of definition for `\_fontspec_parse_wordspace:w`. This function is documented on page ??.)

**Punctuation space** Scaling factor for the nominal `\fontdimen#7`.

```

408 \@@_keys_define_code:nmn {fontspec} {PunctuationSpace}
409 {
410     \str_case:e:nnF {#1}
411     {
412         {WordSpace}
413         {
414             \tl_set:Nn \l_@@_punctspace_adjust_tl
415             { \fontdimen 7 \font = 0 \fontdimen 2 \font }
416         }
417         {TwiceWordSpace}
418         {
419             \tl_set:Nn \l_@@_punctspace_adjust_tl
420             { \fontdimen 7 \font = 1 \fontdimen 2 \font }
421         }
422     }
423     {
424         \tl_set:Nn \l_@@_punctspace_adjust_tl
425         { \fontdimen 7 \font = #1 \fontdimen 7 \font }
426     }
427 }
428 \@@_aff_error:n {PunctuationSpace}

```

**Secret hook into the font-adjustment code**

```

429 \@@_keys_define_code:nmn {fontspec} {FontAdjustment}
430 {
431     \tl_put_right:Nx \l_@@_postadjust_tl {#1}
432 }

```

**Letterspacing**

```

433 \@@_keys_define_code:nmn {fontspec} {LetterSpace}
434 {
435     \@@_update_featstr:n {letterspace=#1}
436 }

```

**Hyphenation character** This feature takes one of three arguments: ‘None’,  $\langle glyph \rangle$ , or  $\langle slot \rangle$ . If the input isn’t the first, and it’s one character, then it’s the second; otherwise, it’s the third.

LuaTeX decouples hyphenation from font settings, so only HyphenChar=None works for that engine.

```

437 \@@_keys_define_code:nmn {fontspec} {HyphenChar}
438   {
439     \str_if_eq:nnTF {#1} {None}
440     {
441       \tl_put_right:Nn \l_@@_postadjust_tl
442       { \@@_primitive_font_set_hyphenchar:Nn \font {-1} }
443     }
444     {
445 (LU)       \@@_warning:nx {only-xetex-feature} {HyphenChar}
446
447       \tl_if_single:nTF {#1}
448       { \tl_set:Nn \l_@@_hyphenchar_tl {`#1} }
449       { \tl_set:Nn \l_@@_hyphenchar_tl { #1} }
450
451       \exp_args:No \@@_primitive_font_glyph_if_exist:NnTF \l_@@_fontface_cs_tl {\l_@@_hyphen
452       {
453         \tl_put_right:Nn \l_@@_postadjust_tl
454         { \@@_primitive_font_set_hyphenchar:Nn \font { \l_@@_hyphenchar_tl } }
455       }
456       { \@@_error:nxx {no-glyph}{\l_fontspec_fontname_tl}{#1} }
457     }
458   }
459 }
460 \@@_aff_error:n {HyphenChar}

```

**Color** Test first if the color is a named l3color, then if it is a color from xcolor, which names its colours  $\backslash\color@<name>$ . If this fails the argument is assumed to be a hex color.

```

461 \@@_keys_define_code:nmn {fontspec} {Color}
462   {
463 (*XE)
464     \color_if_exist:nTF {#1}
465     {
466       \color_export:nnN {#1} {HTML}\l_@@_hexcol_tl
467     }
468     {
469       \cs_if_exist:cTF { \token_to_str:N \color@ #1 }
470       {
471         \convertcolorspec{named}{#1}{HTML}\l_@@_hexcol_tl
472       }
473       {
474         \int_compare:nTF { \tl_count:n {#1} == 6 }
475         { \tl_set:Nn \l_@@_hexcol_tl {#1} }
476         {
477           \int_compare:nTF { \tl_count:n {#1} == 8 }
478           { \fontspec_parse_colour:viii #1 }

```

```

479         {
480             \bool_if:NF \l_@@_firsttime_bool
481             { \@@_warning:nx {bad-colour} {#1} }
482         }
483     }
484 }
485 }
486 </XE>
487 <*LU>
488 \color_if_exist:nTF {#1}
489 {
490     \tl_set:Nn \l_@@_hexcol_tl {#1}
491 }
492 {
493     \cs_if_exist:cTF { \token_to_str:N \color@ #1 }
494     {
495         \convertcolourspec{named}{#1}{HTML}\l_@@_hexcol_tl
496     }
497     {
498         \int_compare:nTF { \tl_count:n {#1} == 6 }
499         { \tl_set:Nn \l_@@_hexcol_tl {#1} }
500         {
501             \int_compare:nTF { \tl_count:n {#1} == 8 }
502             { \fontspec_parse_colour:viii #1 }
503             {
504                 \bool_if:NF \l_@@_firsttime_bool
505                 { \@@_warning:nx {bad-colour} {#1} }
506             }
507         }
508     }
509 }
510 </LU>
511 }
512 \cs_set:Npn \fontspec_parse_colour:viii #1#2#3#4#5#6#7#8
513 {
514     \tl_set:Nn \l_@@_hexcol_tl {#1#2#3#4#5#6}
515     \tl_if_eq:NNF \l_@@_opacity_tl \c_@@_opacity_tl
516     {
517         \bool_if:NF \l_@@_firsttime_bool
518         { \@@_warning:nx {opa-twice-col} {#7#8} }
519     }
520     \tl_set:Nn \l_@@_opacity_tl {#7#8}
521 }
522 \aliasfontfeature{Color}{Colour}
523 \@@_keys_define_code:nmn {fontspec} {Opacity}
524 {
525     \int_set:Nn \l_@@_tmp_int {255}
526     \@@_int_mult_truncate:Nn \l_@@_tmp_int { #1 }
527     \tl_if_eq:NNF \l_@@_opacity_tl \c_@@_opacity_tl
528     {
529         \bool_if:NF \l_@@_firsttime_bool

```



```

530     { \@@_warning:nx {opa-twice} {#1} }
531   }
532   \tl_set:Nx \l_@@_opacity_tl
533     {
534 (LU)     ,
535         \int_compare:nT { \l_@@_tmp_int <= "F } {0} % zero pad
536         \int_to_hex:n { \l_@@_tmp_int }
537     }
538   }

```

## Mapping

```

539 (*XE)
540 \@@_keys_define_code:nnn {fontspec-aat} {Mapping}
541   {
542     \tl_set:Nn \l_@@_mapping_tl { #1 }
543   }
544 \@@_keys_define_code:nnn {fontspec-opentype} {Mapping}
545   {
546     \tl_set:Nn \l_@@_mapping_tl { #1 }
547   }
548 (/XE)
549 (*LU)
550 \@@_keys_define_code:nnn {fontspec-opentype} {Mapping}
551   {
552     \str_if_eq:nnTF {#1} {tex-text}
553     {
554       \@@_warning:n {no-mapping-ligtext}
555       \msg_redirect_name:nnn {fontspec} {no-mapping-ligtext} {none}
556       \keys_set:nn {fontspec-opentype} { Ligatures=TeX }
557     }
558     { \@@_warning:n {no-mapping} }
559   }
560 (/LU)

```

### 1.4.1 Continuous font axes

```

561 (*XE)
562 \@@_keys_define_code:nnn {fontspec} {Weight}
563   {
564     \@@_update_featstr:n{weight=#1}
565   }
566 (/XE)
567 (LU)\@@_define_opentype_variation_axis:nn {Weight} {wght}
568 (*XE)
569 \@@_keys_define_code:nnn {fontspec} {Width}
570   {
571     \@@_update_featstr:n{width=#1}
572   }
573 (/XE)
574 (LU)\@@_define_opentype_variation_axis:nn {Width} {wdth}
575 \@@_define_opentype_variation_axis:nn {Slant} {slnt}

```

```

576 \@@_keys_define_code:nmn {fontspec} {OpticalSize}
577 <*XE>
578 {
579   \bool_if:NTF \l_@@_ot_bool
580   {
581     \tl_set:Nn \l_@@_optical_size_tl {/ S = #1}
582   }
583   {
584     \bool_if:NT \l_@@_mm_bool
585     {
586       \@@_update_featstr:n { optical size = #1 }
587     }
588   }
589   \bool_if:nT { !\l_@@_ot_bool && !\l_@@_mm_bool }
590   {
591     \bool_if:NT \l_@@_firsttime_bool
592     { \@@_warning:nx {no-opticals} {\l_fontspeg_fontname_tl} }
593   }
594 }
595 </XE>
596 <*LU>
597 {
598   \tl_set:Nn \l_@@_optical_size_tl {/ S = #1}
599 }
600 </LU>

```

For other potentially font specific variation axes, there is a raw setter available:

```

601 \@@_keys_define_code:nmn {fontspec-opentype} {RawAxis}
602 {
603   \prop_gput_from_keyval:Nn \g_@@_rawvariations_prop {#1}
604 }

```

#### 1.4.2 Variation instances

```

605 \@@_keys_define_code:nmn {fontspec-opentype} {Instance}
606 {
607   \tl_gset:Nn \g_@@_instance_tl {#1}
608 }

```

#### 1.4.3 Font transformations

These are to be specified to apply directly to a font shape:

```

609 \keys_define:nn {fontspec}
610 {
611   FakeSlant .code:n =
612   {
613     \@@_update_featstr:n {slant=#1}
614   },
615   FakeSlant .default:n = {0.2}
616 }
617 \keys_define:nn {fontspec}
618 {
619   FakeStretch .code:n =
620   {

```

```

621     \l_@@_update_featstr:n {extend=#1}
622   },
623   FakeStretch .default:n = {1.2}
624 }
625 \keys_define:nn {fontspec}
626 {
627   FakeBold .code:n =
628   {
629     \l_@@_update_featstr:n {embolden=#1}
630   },
631   FakeBold .default:n = {1.5}
632 }

```

These are to be given to a shape that has no real bold/italic to signal that fontspec should automatically create 'fake' shapes.

The behaviour is currently that only if both `AutoFakeSlant` and `AutoFakeBold` are specified, the bold italic is also faked.

These features presently *override* real shapes found in the font; in the future I'd like these features to be ignored in this case, instead. (This is just a bit harder to program in the current design of fontspec.)

```

633 \keys_define:nn {fontspec}
634 {
635   AutoFakeSlant .code:n =
636   {
637     \bool_if:NT \l_@@_firsttime_bool
638     {
639       \tl_set:Nn \l_@@_fake_slant_tl {#1}
640       \clist_put_right:Nn \l_@@_fontfeat_it_clist {FakeSlant=#1}
641       \tl_set_eq:NN \l_@@_fontname_it_tl \l_fontspeg_fontname_tl
642       \bool_set_false:N \l_@@_noit_bool
643
644       \tl_if_empty:NF \l_@@_fake_embolden_tl
645       {
646         \clist_put_right:Nx \l_@@_fontfeat_bfit_clist
647         {FakeBold=\l_@@_fake_embolden_tl}
648         \clist_put_right:Nx \l_@@_fontfeat_bfit_clist {FakeSlant=#1}
649         \tl_set_eq:NN \l_@@_fontname_bfit_tl \l_fontspeg_fontname_tl
650       }
651     }
652   },
653   AutoFakeSlant .default:n = {0.2}
654 }

```

Same but reversed:

```

655 \keys_define:nn {fontspec}
656 {
657   AutoFakeBold .code:n =
658   {
659     \bool_if:NT \l_@@_firsttime_bool
660     {
661       \tl_set:Nn \l_@@_fake_embolden_tl {#1}
662       \clist_put_right:Nn \l_@@_fontfeat_bf_clist {FakeBold=#1}

```

```

663         \tl_set_eq:NN \l_@@_fontname_bf_tl \l_fontspec_fontname_tl
664         \bool_set_false:N \l_@@_nobf_bool
665
666         \tl_if_empty:NF \l_@@_fake_slant_tl
667         {
668             \clist_put_right:Nx \l_@@_fontfeat_bfit_clist
669             {FakeSlant=\l_@@_fake_slant_tl}
670             \clist_put_right:Nx \l_@@_fontfeat_bfit_clist {FakeBold=#1}
671             \tl_set_eq:NN \l_@@_fontname_bfit_tl \l_fontspec_fontname_tl
672         }
673     }
674 },
675 AutoFakeBold .default:n = {1.5}
676 }

```

#### 1.4.4 Raw feature string

This allows savvy X<sub>Y</sub>TeX-ers to input font features manually if they have already memorised the OpenType abbreviations and don't mind not having error checking.

```

677 \@@_keys_define_code:nmn {fontspec-opentype} {RawFeature}
678 {
679     \@@_update_featstr:n {#1}
680 }
681 \@@_keys_define_code:nmn {fontspec-aat} {RawFeature}
682 {
683     \@@_update_featstr:n {#1}
684 }

```

## File XIV

# fontspec-code-feat-opentype.dtx

## 1 OpenType feature definitions

```
1 \@@_feat_prop_add:mn {salt} { Alternate\,=\,$N$ }
2 \@@_feat_prop_add:mn {nalt} { Annotation\,=\,$N$ }
3 \@@_feat_prop_add:mn {ornm} { Ornament\,=\,$N$ }
4 \@@_feat_prop_add:mn {cvNN} { CharacterVariant\,=\,$N$:$M$ }
5 \@@_feat_prop_add:mn {ssNN} { StylisticSet\,=\,$N$ }
```

## 2 Regular key=val / tag definitions

### 2.1 Ligatures

```
6 \@@_define_opentype_feature_group:n {Ligatures}
7 \@@_define_opentype_feature:nnnnn {Ligatures} {ResetAll} {} {}
8 {
9   +dlig,-dlig,+rlig,-rlig,+liga,-liga,+dlig,-dlig,+clig,-clig,+hlig,-hlig,
10  <XE> mapping = tex-text
11  <LU> +tlig,-tlig
12  }
13 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Required}      {rlig} {rlig} {}
14 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Common}      {liga} {liga} {}
15 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Rare}        {dlig} {dlig} {}
16 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Discretionary} {dlig} {dlig} {}
17 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Contextual}  {clig} {clig} {}
18 \@@_define_opentype_onoffreset:nnnnn {Ligatures} {Historic}   {hlig} {hlig} {}
```

Emulate CM extra ligatures.

```
19 <*XE>
20 \keys_define:nn {fontspec-opentype}
21 {
22   Ligatures / TeX .code:n = { \tl_set:Nn \l_@@_mapping_tl {tex-text} },
23   Ligatures / TeXOff .code:n = { \tl_clear:N \l_@@_mapping_tl },
24   Ligatures / TeXReset .code:n = { \tl_clear:N \l_@@_mapping_tl },
25 }
26 </XE>
27 <LU>\@@_define_opentype_onoffreset:nnnnn {Ligatures} {TeX} {} {tlig} {}
```

### 2.2 Letters

```
28 \@@_define_opentype_feature_group:n {Letters}
29 \@@_define_opentype_feature:nnnnn {Letters} {ResetAll} {} {}
30 {
31  <LU> +lower,-lower,+upper,-upper,+case,+cpSP,
32      +smcp,+pcap,+c2sc,+c2pc,+unic,+rand,
33      -smcp,-pcap,-c2sc,-c2pc,-unic,-rand
34  }
35 <*LU>
```

```

36 \keys_define:nn {fontspec-opentype}
37 {
38   Letters / Uppercase .code:n = {
39     \@@_make_OT_feature:nnn {} {+upper} {+lower}
40     \@@_make_OT_feature:nnn {} {+case} {}
41     \@@_make_OT_feature:nnn {} {+csp} {}
42   },
43 }
44 \@@_define_opentype_feature:nnnnn {Letters} {UppercaseOff} {} {-upper} {+case,+csp}
45 \@@_define_opentype_feature:nnnnn {Letters} {UppercaseReset} {} {} {+upper,-upper}
46 \@@_define_opentype_onoffreset:nnnnn {Letters} {Lowercase} {} {lower} {+upper,+case,+csp}
47 </LU>
48 \@@_define_opentype_onoffreset:nnnnn {Letters} {SmallCaps} {smcp} {smcp} {+pcap,+unic}
49 \@@_define_opentype_onoffreset:nnnnn {Letters} {PetiteCaps} {pcap} {pcap} {+smcp,+unic}
50 \@@_define_opentype_onoffreset:nnnnn {Letters} {UppercaseSmallCaps} {c2sc} {c2sc} {+c2pc,+unic}
51 \@@_define_opentype_onoffreset:nnnnn {Letters} {UppercasePetiteCaps} {c2pc} {c2pc} {+c2sc,+unic}
52 \@@_define_opentype_onoffreset:nnnnn {Letters} {Unicase} {unic} {unic} {}
53 \@@_define_opentype_onoffreset:nnnnn {Letters} {Random} {rand} {rand} {}

```

## 2.3 Numbers

```

54 \@@_define_opentype_feature_group:n {Numbers}
55 \@@_define_opentype_feature:nnnnn {Numbers} {ResetAll} {} {}
56 {
57   +tnum,-tnum,
58   +pnum,-pnum,
59   +onum,-onum,
60   +lnum,-lnum,
61   +zero,-zero,
62   +anum,-anum,
63 }
64 \@@_define_opentype_onoffreset:nnnnn {Numbers} {Monospaced} {tnum} {tnum} {+pnum,-pnum}
65 \@@_define_opentype_onoffreset:nnnnn {Numbers} {Proportional} {pnum} {pnum} {+tnum,-tnum}
66 \@@_define_opentype_onoffreset:nnnnn {Numbers} {Lowercase} {onum} {onum} {+lnum,-lnum}
67 \@@_define_opentype_onoffreset:nnnnn {Numbers} {Uppercase} {lnum} {lnum} {+onum,-onum}
68 \@@_define_opentype_onoffreset:nnnnn {Numbers} {SlashedZero} {zero} {zero} {}
69 \aliasfontfeatureoption {Numbers} {Monospaced} {Tabular}
70 \aliasfontfeatureoption {Numbers} {Lowercase} {OldStyle}
71 \aliasfontfeatureoption {Numbers} {Uppercase} {Lining}

```

luaotload provides a custom anum feature for replacing Latin (AKA Arabic) numbers with Arabic (AKA Indic-Arabic). The same feature maps to Farsi (Persian) numbers if font language is Farsi.

```

72 <LU> \@@_define_opentype_onoffreset:nnnnn {Numbers} {Arabic} {anum} {anum} {}

```

## 2.4 Vertical position

```

73 \@@_define_opentype_feature_group:n {VerticalPosition}
74 \@@_define_opentype_feature:nnnnn {VerticalPosition} {ResetAll} {} {}
75 {
76   +sups,-sups,
77   +subs,-subs,
78   +ordn,-ordn,

```

```

79     +numr,-numr,
80     +dnom,-dnom,
81     +sinf,-sinf,
82   }
83 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {Superior}           {supr} {supr} {+s
84 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {Inferior}           {subr} {subr} {+s
85 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {Ordinal}            {ordn} {ordn} {+s
86 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {Numerator}          {numr} {numr} {+s
87 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {Denominator}        {dnom} {dnom} {+s
88 \@@_define_opentype_onoffreset:nnnnn {VerticalPosition} {ScientificInferior} {sinf} {sinf} {+s

```

## 2.5 Contextuals

```

89 \@@_define_opentype_feature_group:n {Contextuals}
90 \@@_define_opentype_feature:nnnnn {Contextuals} {ResetAll} {} {}
91 {
92   +cswh,-cswh,
93   +calt,-calt,
94   +init,-init,
95   +fina,-fina,
96   +falt,-falt,
97   +medi,-medi,
98 }
99 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {Swash}           {cswh} {cswh} {}
100 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {Alternate}        {calt} {calt} {}
101 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {WordInitial}      {init} {init} {}
102 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {WordFinal}        {fina} {fina} {}
103 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {LineFinal}        {falt} {falt} {}
104 \@@_define_opentype_onoffreset:nnnnn {Contextuals} {Inner}            {medi} {medi} {}

```

## 2.6 Diacritics

```

105 \@@_define_opentype_feature_group:n {Diacritics}
106 \@@_define_opentype_feature:nnnnn {Diacritics} {ResetAll} {} {}
107 {
108   +mark,-mark,
109   +mkmk,-mkmk,
110   +abvm,-abvm,
111   +blwm,-blwm,
112 }
113 \@@_define_opentype_onoffreset:nnnnn {Diacritics} {MarkToBase} {mark} {mark} {}
114 \@@_define_opentype_onoffreset:nnnnn {Diacritics} {MarkToMark} {mkmk} {mkmk} {}
115 \@@_define_opentype_onoffreset:nnnnn {Diacritics} {AboveBase} {abvm} {abvm} {}
116 \@@_define_opentype_onoffreset:nnnnn {Diacritics} {BelowBase} {blwm} {blwm} {}

```

## 2.7 Kerning

```

117 \@@_define_opentype_feature_group:n {Kerning}
118 \@@_define_opentype_feature:nnnnn {Kerning} {ResetAll} {} {}
119 {
120   +csp, -csp,
121   +kern, -kern,
122 }

```

```

123 \@@_define_opentype_onoffreset:nnnnn {Kerning} {Uppercase} {csp} {csp} {}
124 \@@_define_opentype_feature:nnnnn {Kerning} {On} {kern} {+kern} {-kern}
125 \@@_define_opentype_feature:nnnnn {Kerning} {Off} {kern} {-kern} {+kern}
126 \@@_define_opentype_feature:nnnnn {Kerning} {Reset} {} {} {+kern,-kern}

```

## 2.8 Fractions

```

127 \@@_define_opentype_feature_group:n {Fractions}
128 \@@_define_opentype_feature:nnnnn {Fractions} {ResetAll} {} {}
129 {
130   +frac,-frac,
131   +afrc,-afrc,
132 }
133 \@@_define_opentype_feature:nnnnn {Fractions} {On} {frac} {+frac} {}
134 \@@_define_opentype_feature:nnnnn {Fractions} {Off} {frac} {-frac} {}
135 \@@_define_opentype_feature:nnnnn {Fractions} {Reset} {} {} {+frac,-frac}
136 \@@_define_opentype_onoffreset:nnnnn {Fractions} {Alternate} {afrc} {afrc} {-frac}
137 \@@_define_opentype_feature_group:n {LocalForms}
138 \@@_define_opentype_feature:nnnnn {LocalForms} {On} {locl} {+locl} {}
139 \@@_define_opentype_feature:nnnnn {LocalForms} {Off} {locl} {-locl} {}
140 \@@_define_opentype_feature:nnnnn {LocalForms} {Reset} {} {} {+locl,-locl}

```

## 2.9 Style

```

141 \@@_define_opentype_feature_group:n {Style}
142 \@@_define_opentype_feature:nnnnn {Style} {ResetAll} {} {}
143 {
144   +salt,-salt,
145   +ital,-ital,
146   +ruby,-ruby,
147   +swsh,-swsh,
148   +hist,-hist,
149   +titl,-titl,
150   +hkna,-hkna,
151   +vkna,-vkna,
152   +ssty=0,-ssty=0,
153   +ssty=1,-ssty=1,
154 }
155 \@@_define_opentype_onoffreset:nnnnn {Style} {Alternate} {salt} {salt} {}
156 \@@_define_opentype_onoffreset:nnnnn {Style} {Italic} {ital} {ital} {}
157 \@@_define_opentype_onoffreset:nnnnn {Style} {Ruby} {ruby} {ruby} {}
158 \@@_define_opentype_onoffreset:nnnnn {Style} {Swash} {swsh} {swsh} {}
159 \@@_define_opentype_onoffreset:nnnnn {Style} {Cursive} {swsh} {curs} {}
160 \@@_define_opentype_onoffreset:nnnnn {Style} {Historic} {hist} {hist} {}
161 \@@_define_opentype_onoffreset:nnnnn {Style} {Titling} {titl} {titl} {}
162 \@@_define_opentype_onoffreset:nnnnn {Style} {TitlingCaps} {titl} {titl} {} % backwards c
163 \@@_define_opentype_onoffreset:nnnnn {Style} {HorizontalKana} {hkna} {hkna} {+vkna,+pkna}
164 \@@_define_opentype_onoffreset:nnnnn {Style} {VerticalKana} {vkna} {vkna} {+hkna,+pkna}
165 \@@_define_opentype_onoffreset:nnnnn {Style} {ProportionalKana} {pkna} {pkna} {+vkna,+hkna}
166 \@@_define_opentype_feature:nnnnn {Style} {MathScript} {ssty} {+ssty=0} {+ssty=1}
167 \@@_define_opentype_feature:nnnnn {Style} {MathScriptScript} {ssty} {+ssty=1} {+ssty=0}
168 \@@_define_opentype_onoffreset:nnnnn {Style} {Uppercase} {case} {case} {}

```



## 2.10 CJK shape

```
169 \@@_define_opentype_feature_group:n {CJKShape}
170 \@@_define_opentype_feature:nnnnn {CJKShape} {ResetAll} {} {}
171 {
172   +trad,-trad,
173   +smp1,-smp1,
174   +jp78,-jp78,
175   +jp83,-jp83,
176   +jp90,-jp90,
177   +jp04,-jp04,
178   +expt,-expt,
179   +nlck,-nlck,
180 }
181 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {Traditional} {trad} {trad} {+smp1,+jp78,+jp83}
182 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {Simplified} {smp1} {smp1} {+trad,+jp78,+jp83}
183 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {JIS1978} {jp78} {jp78} {+trad,+smp1,+jp83}
184 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {JIS1983} {jp83} {jp83} {+trad,+smp1,+jp78}
185 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {JIS1990} {jp90} {jp90} {+trad,+smp1,+jp78}
186 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {JIS2004} {jp04} {jp04} {+trad,+smp1,+jp78}
187 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {Expert} {expt} {expt} {+trad,+smp1,+jp78}
188 \@@_define_opentype_onoffreset:nnnnn {CJKShape} {NLC} {nlck} {nlck} {+trad,+smp1,+jp78}
```

## 2.11 Character width

```
189 \@@_define_opentype_feature_group:n {CharacterWidth}
190 \@@_define_opentype_feature:nnnnn {CharacterWidth} {ResetAll} {} {}
191 {
192   +pwid,-pwid,
193   +fwid,-fwid,
194   +hwid,-hwid,
195   +twid,-twid,
196   +qwid,-qwid,
197   +palt,-palt,
198   +halt,-halt,
199 }
200 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {Proportional} {pwid} {pwid} {+}
201 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {Full} {fwid} {fwid} {+}
202 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {Half} {hwid} {hwid} {+}
203 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {Third} {twid} {twid} {+}
204 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {Quarter} {qwid} {qwid} {+}
205 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {AlternateProportional} {palt} {palt} {+}
206 \@@_define_opentype_onoffreset:nnnnn {CharacterWidth} {AlternateHalf} {halt} {halt} {+}
```

## 2.12 Vertical

According to spec vkrn must also activate vpal if available but for simplicity we don't do that here (yet?).

```
207 \@@_define_opentype_feature_group:n {Vertical}
208 \@@_define_opentype_onoffreset:nnnnn {Vertical} {RotatedGlyphs} {vrt2} {vrt2} {+vrtr,+}
209 \@@_define_opentype_onoffreset:nnnnn {Vertical} {AlternatesForRotation} {vrtr} {vrtr} {+vrt2}
210 \@@_define_opentype_onoffreset:nnnnn {Vertical} {Alternates} {vert} {vert} {+vrt2}
```

```

211 \@@_define_opentype_onoffreset:nnnnn {Vertical} {KanaAlternates}      {vkna} {vkna} {+hkna}
212 \@@_define_opentype_onoffreset:nnnnn {Vertical} {Kerning}           {vkern} {vkern} {}
213 \@@_define_opentype_onoffreset:nnnnn {Vertical} {AlternateMetrics}   {valt} {valt} {+vhal,+}
214 \@@_define_opentype_onoffreset:nnnnn {Vertical} {HalfMetrics}       {vhal} {vhal} {+valt,+}
215 \@@_define_opentype_onoffreset:nnnnn {Vertical} {ProportionalMetrics} {vpal} {vpal} {+valt,+}

```

## 3 OpenType features that need numbering

### 3.1 Alternate

```

216 \@@_define_opentype_feature_group:n {Alternate}
217 \keys_define:nn {fontspec-opentype}
218 {
219     Alternate .default:n = {0} ,
220     Alternate .groups:n = {opentype},
221     Alternate / unknown .code:n =
222     {
223         \clist_map_inline:nn {#1}
224         { \@@_make_OT_feature:nnn {salt}{ +salt = ##1 }{} }
225     }
226 }
227 <*LU>
228 \keys_define:nn {fontspec-opentype}
229 {
230     Alternate / Random .code:n =
231     { \@@_make_OT_feature:nnn {salt}{ +salt = random }{} } ,
232 }
233 </LU>
234 \aliasfontfeature{Alternate}{StylisticAlternates}

```

### 3.2 Variant / StylisticSet

```

235 \@@_define_opentype_feature_group:n {Variant}
236 \keys_define:nn {fontspec-opentype}
237 {
238     Variant .default:n = {0} ,
239     Variant .groups:n = {opentype} ,
240     Variant / unknown .code:n =
241     {
242         \clist_map_inline:nn {#1}
243         {
244             \@@_make_OT_feature:xxx { ss \two@digits {##1} } { +ss \two@digits {##1} } {}
245         }
246     }
247 }
248 \aliasfontfeature{Variant}{StylisticSet}

```

### 3.3 CharacterVariant

```

249 \@@_define_opentype_feature_group:n {CharacterVariant}
250 \use:x

```

```

251 {
252   \cs_new:Npn \exp_not:N \fontspec_parse_cv:w
253     ##1 \c_colon_str ##2 \c_colon_str ##3 \exp_not:N \q_nil
254     {
255       \@@_make_OT_feature:xxx
256       { cv \exp_not:N \two@digits {##1} }
257       { +cv \exp_not:N \two@digits {##1} = ##2 } {}
258     }
259   \keys_define:nn {fontspec-opentype}
260     {
261       CharacterVariant / unknown .code:n =
262       {
263         \clist_map_inline:nn {##1}
264         {
265           \exp_not:N \fontspec_parse_cv:w
266           #####1 \c_colon_str 0 \c_colon_str \exp_not:N \q_nil
267         }
268       }
269     }
270 }

```

Possibilities: a:0:\q\_nil or a:b:0:\q\_nil.

### 3.4 Annotation

```

271 \@@_define_opentype_feature_group:n {Annotation}
272 \keys_define:nn {fontspec-opentype}
273 {
274   Annotation .default:n = {0} ,
275   Annotation .groups:n = {opentype},
276   Annotation / unknown .code:n =
277   {
278     \@@_make_OT_feature:nnn {nalt} {+nalt=#1} {}
279   }
280 }

```

### 3.5 Ornament

```

281 \@@_define_opentype_feature_group:n {Ornament}
282 \keys_define:nn {fontspec-opentype}
283 {
284   Ornament .default:n = {0} ,
285   Ornament .groups:n = {opentype},
286   Ornament / unknown .code:n =
287   {
288     \@@_make_OT_feature:nnn {ornm} {+ornm=#1} {}
289   }
290 }

```

## 4 Script and Language

### 4.1 Script

```

291 \keys_define:nn {fontspec-opentype}

```

```

292 {
293     Script .choice: ,
294     Script .groups:n = {opentype} ,
295 }
296 \cs_new:Nn \fontspec_new_script:nn
297 {
298     \keys_define:nn {fontspec-opentype} { Script / #1 .code:n =
299         {
300 <debug>\typeout{Trying~[Script=#1]}
301         \bool_set_false:N \l_@@_scriptlang_exist_bool
302         \clist_map_inline:nn {#2}
303         {
304             \exp_args:No \@@_check_script:NnT \l_@@_fontface_cs_tl {####1}
305             {
306 <debug>\typeout{Script~tag~found:~####1}
307                 \tl_set:Nn \l_@@_script_name_tl {#1}
308                 \tl_set:Nn \l_@@_script_tl {####1}
309                 \int_set:Nn \l_@@_script_int {\l_@@_strnum_int}
310                 \bool_set_true:N \l_@@_scriptlang_exist_bool
311                 \tl_gset:Nx \g_@@_single_feat_tl { script=####1 }
312                 \clist_map_break:
313             }
314         }
315     }
316     \bool_if:NF \l_@@_scriptlang_exist_bool
317     {
318 <debug>\typeout{Script~not~found!}
319         \@@_info:nxx {script-not-exist} {\l_fontspec_fontname_tl} {#1}
320         \clist_set:Nn \l_tmpa_clist {#2}
321         \clist_get:NN \l_tmpa_clist \l_@@_script_tl
322         \exp_args:Noo \@@_check_script:NnF \l_@@_fontface_cs_tl \l_@@_script_tl
323         {
324             \tl_set:Nn \l_@@_script_name_tl {#1}
325             \int_set:Nn \l_@@_script_int {\l_@@_strnum_int}
326             \tl_gset:Nx \g_@@_single_feat_tl { script=\l_@@_script_tl }
327         }
328     }
329 }
330 }

When script is not explicitly requested, use this list:
331 \clist_new:N \g_@@_default_scripts_clist
332 \cs_new:Nn \fontspec_default_script:n
333 {
334     \clist_gset:Nn \g_@@_default_scripts_clist {#1}
335 }
336 \fontspec_default_script:n {latn,DFLT}
337 \keys_define:nn {fontspec-opentype} { Script / CustomDefault .code:n =
338     {
339 <debug>\typeout{Trying~CustomDefault~Script}

```

```

340 \bool_set_false:N \l_@@_scriptlang_exist_bool
341 \clist_map_inline:Nn \g_@@_default_scripts_clist
342 {
343   \exp_args:No \@@_check_script:NnT \l_@@_fontface_cs_tl {##1}
344   {
345 (debug)\typeout{Script~tag~found:~##1}
346     \tl_set:Nn \l_@@_script_name_tl {Default (##1)}
347     \tl_set:Nn \l_@@_script_tl {##1}
348     \int_set:Nn \l_@@_script_int {\l_@@_strnum_int}
349     \bool_set_true:N \l_@@_scriptlang_exist_bool
350     \tl_gset:Nx \g_@@_single_feat_tl { script=##1 }
351     \clist_map_break:
352   }
353 }
354 \bool_if:NF \l_@@_scriptlang_exist_bool
355 {
356 (debug)\typeout{Script~not~found!}
357   \tl_clear:N \l_@@_script_name_tl
358 }
359 }
360 }

```

## 4.2 Language

```

361 \keys_define:nn {fontspec-opentype}
362 {
363   Language .choice: ,
364   Language .groups:n = {opentype} ,
365 }
366 \cs_new:Nn \fontspec_new_lang:nn
367 {
368   \keys_define:nn {fontspec-opentype} { Language / #1 .code:n =
369     {
370       \bool_set_false:N \l_@@_scriptlang_exist_bool
371       \clist_map_inline:nn {#2}
372       {
373         \exp_args:No \@@_check_lang:NnTF \l_@@_fontface_cs_tl {#####1}
374         {
375           \tl_set:Nn \l_@@_lang_tl {#####1}
376           \int_set:Nn \l_@@_language_int {\l_@@_strnum_int}
377           \tl_gset:Nx \g_@@_single_feat_tl { language=#####1 }
378           \bool_set_true:N \l_@@_scriptlang_exist_bool
379           \clist_map_break:
380         }
381       }
382     }
383 }

```

If not found give a warning but load it anyway:

```

382 \bool_if:NF \l_@@_scriptlang_exist_bool
383 {
384 (debug)\typeout{Lang~not~found!}
385   \@@_info:nx {language-not-exist} {#1}
386   \clist_set:Nn \l_tmpa_clist {#2}
387   \clist_get:NN \l_tmpa_clist \l_@@_lang_tl

```

```

388         \exp_args:Noo \@@_check_lang:NnF \l_@@_fontface_cs_tl \l_@@_lang_tl
389         {
390             \tl_set:Nn \l_@@_lang_name_tl {#1}
391             \int_set:Nn \l_@@_language_int {\l_@@_strnum_int}
392             \tl_gset:Nx \g_@@_single_feat_tl { language=\l_@@_lang_tl }
393         }
394     }
395 }
396 }
397 }

```

**Language=Default** These are special-cased to avoid the additional logic above. From memory, the OpenType default language is hardcoded to have a zero value, although this might be some X<sub>Y</sub>TeX-specific thing.

```

398 \clist_new:N \g_@@_default_langs_clist
399 \cs_new:Nn \fontspec_default_lang:n
400 {
401     \clist_gset:Nn \g_@@_default_langs_clist {#1}
402 }
403 \fontspec_default_lang:n {dflt}
404 \@@_keys_define_code:nnn {fontspec-opentype} { Language / Default }
405 {
406     \tl_set:Nn \l_@@_lang_tl {dflt}
407     \int_zero:N \l_@@_language_int
408     \tl_gset:Nn \g_@@_single_feat_tl { language=dflt }
409 }

```

## 5 Backwards compatibility

```

410 \cs_new:Nn \@@_ot_compat:nn
411 {
412     \aliasfontfeatureoption {#1} {#2off} {No#2}
413 }
414 \@@_ot_compat:nn {Ligatures} {Rare}
415 \@@_ot_compat:nn {Ligatures} {Required}
416 \@@_ot_compat:nn {Ligatures} {Common}
417 \@@_ot_compat:nn {Ligatures} {Discretionary}
418 \@@_ot_compat:nn {Ligatures} {Contextual}
419 \@@_ot_compat:nn {Ligatures} {Historic}
420 \@@_ot_compat:nn {Numbers} {SlashedZero}
421 \@@_ot_compat:nn {Contextuals} {Swash}
422 \@@_ot_compat:nn {Contextuals} {Alternate}
423 \@@_ot_compat:nn {Contextuals} {WordInitial}
424 \@@_ot_compat:nn {Contextuals} {WordFinal}
425 \@@_ot_compat:nn {Contextuals} {LineFinal}
426 \@@_ot_compat:nn {Contextuals} {Inner}
427 \@@_ot_compat:nn {Diacritics} {MarkToBase}
428 \@@_ot_compat:nn {Diacritics} {MarkToMark}
429 \@@_ot_compat:nn {Diacritics} {AboveBase}
430 \@@_ot_compat:nn {Diacritics} {BelowBase}

```

## File XV

# fontspec-code-scripts.dtx

## 1 Font script definitions

```
1 \newfontscript{Adlam}{adlm}
2 \newfontscript{Ahom}{ahom}
3 \newfontscript{Anatolian~Hieroglyphs}{hluw}
4 \newfontscript{Arabic}{arab}
5 \newfontscript{Armenian}{armn}
6 \newfontscript{Avestan}{avst}
7 \newfontscript{Balinese}{bali}
8 \newfontscript{Bamum}{bamu}
9 \newfontscript{Bassa~Vah}{bass}
10 \newfontscript{Batak}{batk}
11 \newfontscript{Bengali}{bng2,beng}
12 \newfontscript{Bhaiksuki}{bhks}
13 \newfontscript{Bopomofo}{bopo}
14 \newfontscript{Brahmi}{brah}
15 \newfontscript{Braille}{brai}
16 \newfontscript{Buginese}{bugi}
17 \newfontscript{Buhid}{buhd}
18 \newfontscript{Byzantine~Music}{byzm}
19 \newfontscript{Canadian~Syllabics}{cans}
20 \newfontscript{Carian}{cari}
21 \newfontscript{Caucasian~Albanian}{aghb}
22 \newfontscript{Chakma}{cakm}
23 \newfontscript{Cham}{cham}
24 \newfontscript{Cherokee}{cher}
25 \newfontscript{Chorasmian}{chrs}
26 \newfontscript{CJK~Ideographic}{hani}
27 \newfontscript{Coptic}{copt}
28 \newfontscript{Cypriot~Syllabary}{cpri}
29 \newfontscript{Cypro~Minoan}{cpmn}
30 \newfontscript{Cyrillic}{cyrl}
31 \newfontscript{Default}{DFLT}
32 \newfontscript{Deseret}{dsrt}
33 \newfontscript{Devanagari}{dev2,deva}
34 \newfontscript{Dives~Akuru}{diak}
35 \newfontscript{Dogra}{dogr}
36 \newfontscript{Duployan}{dupl}
37 \newfontscript{Egyptian~Hieroglyphs}{egyp}
38 \newfontscript{Elbasan}{elba}
39 \newfontscript{Elymaic}{elym}
40 \newfontscript{Ethiopic}{ethi}
41 \newfontscript{Georgian}{geor}
42 \newfontscript{Glagolitic}{glag}
43 \newfontscript{Gothic}{goth}
44 \newfontscript{Grantha}{gran}
```

```

45 \newfontscript{Greek}{grek}
46 \newfontscript{Gujarati}{gjr2,gujr}
47 \newfontscript{Gunjala-Gondi}{gong}
48 \newfontscript{Gurmukhi}{gur2,guru}
49 \newfontscript{Hangul-Jamo}{jamo}
50 \newfontscript{Hangul}{hang}
51 \newfontscript{Hanifi-Rohingya}{rohng}
52 \newfontscript{Hanunoo}{hano}
53 \newfontscript{Hatran}{hatr}
54 \newfontscript{Hebrew}{hebr}
55 \newfontscript{Hiragana~and~Katakana}{kana}
56 \newfontscript{Imperial~Aramaic}{armi}
57 \newfontscript{Inscriptional~Pahlavi}{phli}
58 \newfontscript{Inscriptional~Parthian}{prti}
59 \newfontscript{Javanese}{java}
60 \newfontscript{Kaithi}{kthi}
61 \newfontscript{Kannada}{knd2,knda}
62 \newfontscript{Kawi}{kawi}
63 \newfontscript{Kayah-Li}{kali}
64 \newfontscript{Kharosthi}{khar}
65 \newfontscript{Khitan~Small~Script}{kits}
66 \newfontscript{Khmer}{khmr}
67 \newfontscript{Khojki}{khoj}
68 \newfontscript{Khudawadi}{sind}
69 \newfontscript{Lao}{lao~}
70 \newfontscript{Latin}{latn}
71 \newfontscript{Lepcha}{lepc}
72 \newfontscript{Limbu}{limb}
73 \newfontscript{Linear~A}{lina}
74 \newfontscript{Linear~B}{linb}
75 \newfontscript{Lisu}{lisu}
76 \newfontscript{Lycian}{lyci}
77 \newfontscript{Lydian}{lydi}
78 \newfontscript{Mahajani}{mahj}
79 \newfontscript{Makasar}{maka}
80 \newfontscript{Malayalam}{mlm2,mlym}
81 \newfontscript{Mandaic}{mand}
82 \newfontscript{Manichaeon}{mani}
83 \newfontscript{Marchen}{marc}
84 \newfontscript{Masaram-Gondi}{gonm}
85 \newfontscript{Math}{math}
86 \newfontscript{Medefaidrin}{medf}
87 \newfontscript{Meitei~Mayek}{mtei}
88 \newfontscript{Mende~Kikakui}{mend}
89 \newfontscript{Meroitic~Cursive}{merc}
90 \newfontscript{Meroitic~Hieroglyphs}{mero}
91 \newfontscript{Miao}{plrd}
92 \newfontscript{Modi}{modi}
93 \newfontscript{Mongolian}{mong}
94 \newfontscript{Mro}{mroo}
95 \newfontscript{Multani}{mult}

```



96 \newfontscript{Musical-Symbols}{musc}  
 97 \newfontscript{Myanmar}{mym2,mymr}  
 98 \newfontscript{N'Ko}{nko~}  
 99 \newfontscript{Nabataean}{nbat}  
 100 \newfontscript{Nag-Mundari}{nagm}  
 101 \newfontscript{Nandinagari}{nand}  
 102 \newfontscript{Newa}{newa}  
 103 \newfontscript{Nushu}{nshu}  
 104 \newfontscript{Nyiakeng-Puachue-Hmong}{hmnp}  
 105 \newfontscript{Odia}{ory2,orya}  
 106 \newfontscript{Ogham}{ogam}  
 107 \newfontscript{Ol-Chiki}{olck}  
 108 \newfontscript{Old-Italic}{ital}  
 109 \newfontscript{Old-Hungarian}{hung}  
 110 \newfontscript{Old-North-Arabian}{narb}  
 111 \newfontscript{Old-Permic}{perm}  
 112 \newfontscript{Old-Persian-Cuneiform}{xpeo}  
 113 \newfontscript{Old-Sogdian}{sogo}  
 114 \newfontscript{Old-South-Arabian}{sarb}  
 115 \newfontscript{Old-Turkic}{orkh}  
 116 \newfontscript{Old-Uyghur}{ougr}  
 117 \newfontscript{Osage}{osge}  
 118 \newfontscript{Osmanya}{osma}  
 119 \newfontscript{Pahawh-Hmong}{hmng}  
 120 \newfontscript{Palmyrene}{palm}  
 121 \newfontscript{Pau-Cin-Hau}{pauc}  
 122 \newfontscript{Phags-pa}{phag}  
 123 \newfontscript{Phoenician}{phnx}  
 124 \newfontscript{Psalter-Pahlavi}{phlp}  
 125 \newfontscript{Rejang}{rjng}  
 126 \newfontscript{Runic}{runr}  
 127 \newfontscript{Samaritan}{samr}  
 128 \newfontscript{Saurashtra}{saur}  
 129 \newfontscript{Sharada}{shrd}  
 130 \newfontscript{Shavian}{shaw}  
 131 \newfontscript{Siddham}{sidd}  
 132 \newfontscript{Sign-Writing}{sgnw}  
 133 \newfontscript{Sinhala}{sinh}  
 134 \newfontscript{Sogdian}{sogd}  
 135 \newfontscript{Sora-Sompeng}{sora}  
 136 \newfontscript{Sumero-Akkadian-Cuneiform}{xsux}  
 137 \newfontscript{Sundanese}{sund}  
 138 \newfontscript{Syloti-Nagri}{sylo}  
 139 \newfontscript{Syriac}{syrc}  
 140 \newfontscript{Tagalog}{tglg}  
 141 \newfontscript{Tagbanwa}{tagb}  
 142 \newfontscript{Tai-Le}{tale}  
 143 \newfontscript{Tai-Lu}{talu}  
 144 \newfontscript{Tai-Tham}{lana}  
 145 \newfontscript{Tai-Viet}{tavt}  
 146 \newfontscript{Takri}{takr}

```

147 \newfontscript{Tamil}{tml2,taml}
148 \newfontscript{Tangsa}{tnsa}
149 \newfontscript{Tangut}{tang}
150 \newfontscript{Telugu}{tel2,telu}
151 \newfontscript{Thaana}{thaa}
152 \newfontscript{Thai}{thai}
153 \newfontscript{Tibetan}{tibt}
154 \newfontscript{Tifinagh}{tfng}
155 \newfontscript{Tirhuta}{tirh}
156 \newfontscript{Toto}{toto}
157 \newfontscript{Ugaritic~Cuneiform}{ugar}
158 \newfontscript{Vai}{vai~}
159 \newfontscript{Vithkuqi}{vith}
160 \newfontscript{Wancho}{wcho}
161 \newfontscript{Warang-Citi}{wara}
162 \newfontscript{Yezidi}{yezi}
163 \newfontscript{Yi}{yi~}
164 \newfontscript{Zanabazar~Square}{zanb}

```

For convenience or backwards compatibility:

```

165 \newfontscript{CJK}{hani}
166 \newfontscript{Kana}{kana}
167 \newfontscript{Maths}{math}
168 \newfontscript{N'ko}{nko~}
169 \newfontscript{Oriya}{ory2,orya}

```

## File XVI

# fontspec-code-lang.dtx

## 1 Font language definitions

```
1 \newfontlanguage{Abaza}{ABA}
2 \newfontlanguage{Abkhazian}{ABK}
3 \newfontlanguage{Adyghe}{ADY}
4 \newfontlanguage{Afrikaans}{AFK}
5 \newfontlanguage{Afar}{AFR}
6 \newfontlanguage{Agaw}{AGW}
7 \newfontlanguage{Altai}{ALT}
8 \newfontlanguage{Amharic}{AMH}
9 \newfontlanguage{Arabic}{ARA}
10 \newfontlanguage{Aari}{ARI}
11 \newfontlanguage{Arakanese}{ARK}
12 \newfontlanguage{Assamese}{ASM}
13 \newfontlanguage{Athapaskan}{ATH}
14 \newfontlanguage{Avar}{AVR}
15 \newfontlanguage{Awadhi}{AWA}
16 \newfontlanguage{Aymara}{AYM}
17 \newfontlanguage{Azeri}{AZE}
18 \newfontlanguage{Badaga}{BAD}
19 \newfontlanguage{Baghelkhandi}{BAG}
20 \newfontlanguage{Balkar}{BAL}
21 \newfontlanguage{Baule}{BAU}
22 \newfontlanguage{Berber}{BBR}
23 \newfontlanguage{Bench}{BCH}
24 \newfontlanguage{Bible~Cree}{BCR}
25 \newfontlanguage{Belarussian}{BEL}
26 \newfontlanguage{Bemba}{BEM}
27 \newfontlanguage{Bengali}{BEN}
28 \newfontlanguage{Bulgarian}{BGR}
29 \newfontlanguage{Bhili}{BHI}
30 \newfontlanguage{Bhojpuri}{BHO}
31 \newfontlanguage{Bikol}{BIK}
32 \newfontlanguage{Bilen}{BIL}
33 \newfontlanguage{Blackfoot}{BKF}
34 \newfontlanguage{Balochi}{BLI}
35 \newfontlanguage{Balante}{BLN}
36 \newfontlanguage{Balti}{BLT}
37 \newfontlanguage{Bambara}{BMB}
38 \newfontlanguage{Bamileke}{BML}
39 \newfontlanguage{Breton}{BRE}
40 \newfontlanguage{Brahui}{BRH}
41 \newfontlanguage{Braj~Bhasha}{BRI}
42 \newfontlanguage{Burmese}{BRM}
43 \newfontlanguage{Bashkir}{BSH}
44 \newfontlanguage{Beti}{BTI}
```

45 \newfontlanguage{Catalan}{CAT}  
46 \newfontlanguage{Cebuano}{CEB}  
47 \newfontlanguage{Chechen}{CHE}  
48 \newfontlanguage{Chaha~Gurage}{CHG}  
49 \newfontlanguage{Chattisgarhi}{CHH}  
50 \newfontlanguage{Chichewa}{CHI}  
51 \newfontlanguage{Chukchi}{CHK}  
52 \newfontlanguage{Chipewyan}{CHP}  
53 \newfontlanguage{Cherokee}{CHR}  
54 \newfontlanguage{Chuvash}{CHU}  
55 \newfontlanguage{Comorian}{CMR}  
56 \newfontlanguage{Coptic}{COP}  
57 \newfontlanguage{Cree}{CRE}  
58 \newfontlanguage{Carrier}{CRR}  
59 \newfontlanguage{Crimean~Tatar}{CRT}  
60 \newfontlanguage{Church~Slavonic}{CSL}  
61 \newfontlanguage{Czech}{CSY}  
62 \newfontlanguage{Danish}{DAN}  
63 \newfontlanguage{Dargwa}{DAR}  
64 \newfontlanguage{Woods~Cree}{DCR}  
65 \newfontlanguage{German}{DEU}  
66 \newfontlanguage{Dogri}{DGR}  
67 \newfontlanguage{Divehi}{DIV}  
68 \newfontlanguage{Djerma}{DJR}  
69 \newfontlanguage{Dangme}{DNG}  
70 \newfontlanguage{Dinka}{DNK}  
71 \newfontlanguage{Dungan}{DUN}  
72 \newfontlanguage{Dzongkha}{DZN}  
73 \newfontlanguage{Ebira}{EBI}  
74 \newfontlanguage{Eastern~Cree}{ECR}  
75 \newfontlanguage{Edo}{EDO}  
76 \newfontlanguage{Efik}{EFI}  
77 \newfontlanguage{Greek}{ELL}  
78 \newfontlanguage{English}{ENG}  
79 \newfontlanguage{Erzya}{ERZ}  
80 \newfontlanguage{Spanish}{ESP}  
81 \newfontlanguage{Estonian}{ETI}  
82 \newfontlanguage{Basque}{EUQ}  
83 \newfontlanguage{Evenki}{EVK}  
84 \newfontlanguage{Even}{EVN}  
85 \newfontlanguage{Ewe}{EWE}  
86 \newfontlanguage{French~Antillean}{FAN}  
87 \newfontlanguage{Farsi}{FAR}  
88 \newfontlanguage{Parsi}{FAR}  
89 \newfontlanguage{Persian}{FAR}  
90 \newfontlanguage{Finnish}{FIN}  
91 \newfontlanguage{Fijian}{FJI}  
92 \newfontlanguage{Flemish}{FLE}  
93 \newfontlanguage{Forest~Nenets}{FNE}  
94 \newfontlanguage{Fon}{FON}  
95 \newfontlanguage{Faroese}{FOS}

96 \newfontlanguage{French}{FRA}  
 97 \newfontlanguage{Frisian}{FRI}  
 98 \newfontlanguage{Friulian}{FRL}  
 99 \newfontlanguage{Futa}{FTA}  
 100 \newfontlanguage{Fulani}{FUL}  
 101 \newfontlanguage{Ga}{GAD}  
 102 \newfontlanguage{Gaelic}{GAE}  
 103 \newfontlanguage{Gagauz}{GAG}  
 104 \newfontlanguage{Galician}{GAL}  
 105 \newfontlanguage{Garshuni}{GAR}  
 106 \newfontlanguage{Garhwali}{GAW}  
 107 \newfontlanguage{Ge'ez}{GEZ}  
 108 \newfontlanguage{Gilyak}{GIL}  
 109 \newfontlanguage{Gumuz}{GMZ}  
 110 \newfontlanguage{Gondi}{GON}  
 111 \newfontlanguage{Greenlandic}{GRN}  
 112 \newfontlanguage{Garo}{GRO}  
 113 \newfontlanguage{Guarani}{GUA}  
 114 \newfontlanguage{Gujarati}{GUJ}  
 115 \newfontlanguage{Haitian}{HAI}  
 116 \newfontlanguage{Halam}{HAL}  
 117 \newfontlanguage{Harauti}{HAR}  
 118 \newfontlanguage{Hausa}{HAU}  
 119 \newfontlanguage{Hawaiin}{HAW}  
 120 \newfontlanguage{Hammer-Banna}{HBN}  
 121 \newfontlanguage{Hiligaynon}{HIL}  
 122 \newfontlanguage{Hindi}{HIN}  
 123 \newfontlanguage{High-Mari}{HMA}  
 124 \newfontlanguage{Hindko}{HND}  
 125 \newfontlanguage{Ho}{HO}  
 126 \newfontlanguage{Harari}{HRI}  
 127 \newfontlanguage{Croatian}{HRV}  
 128 \newfontlanguage{Hungarian}{HUN}  
 129 \newfontlanguage{Armenian}{HYE}  
 130 \newfontlanguage{Igbo}{IBO}  
 131 \newfontlanguage{Ijo}{IJO}  
 132 \newfontlanguage{Ilokano}{ILO}  
 133 \newfontlanguage{Indonesian}{IND}  
 134 \newfontlanguage{Ingush}{ING}  
 135 \newfontlanguage{Inuktitut}{INU}  
 136 \newfontlanguage{Irish}{IRI}  
 137 \newfontlanguage{Irish~Traditional}{IRT}  
 138 \newfontlanguage{Icelandic}{ISL}  
 139 \newfontlanguage{Inari~Sami}{ISM}  
 140 \newfontlanguage{Italian}{ITA}  
 141 \newfontlanguage{Hebrew}{IWR}  
 142 \newfontlanguage{Javanese}{JAV}  
 143 \newfontlanguage{Yiddish}{JII}  
 144 \newfontlanguage{Japanese}{JAN}  
 145 \newfontlanguage{Judezmo}{JUD}  
 146 \newfontlanguage{Jula}{JUL}

147 \newfontlanguage{Kabardian}{KAB}  
148 \newfontlanguage{Kachchi}{KAC}  
149 \newfontlanguage{Kalenjin}{KAL}  
150 \newfontlanguage{Kannada}{KAN}  
151 \newfontlanguage{Karachay}{KAR}  
152 \newfontlanguage{Georgian}{KAT}  
153 \newfontlanguage{Kazakh}{KAZ}  
154 \newfontlanguage{Kebena}{KEB}  
155 \newfontlanguage{Khutsuri-Georgian}{KGE}  
156 \newfontlanguage{Khakass}{KHA}  
157 \newfontlanguage{Khanty-Kazim}{KHK}  
158 \newfontlanguage{Khmer}{KHM}  
159 \newfontlanguage{Khanty-Shurishkar}{KHS}  
160 \newfontlanguage{Khanty-Vakhi}{KHV}  
161 \newfontlanguage{Khowar}{KHW}  
162 \newfontlanguage{Kikuyu}{KIK}  
163 \newfontlanguage{Kirghiz}{KIR}  
164 \newfontlanguage{Kisii}{KIS}  
165 \newfontlanguage{Kokni}{KKN}  
166 \newfontlanguage{Kalmyk}{KLM}  
167 \newfontlanguage{Kamba}{KMB}  
168 \newfontlanguage{Kumaoni}{KMN}  
169 \newfontlanguage{Komo}{KMO}  
170 \newfontlanguage{Komso}{KMS}  
171 \newfontlanguage{Kanuri}{KNR}  
172 \newfontlanguage{Kodagu}{KOD}  
173 \newfontlanguage{Korean-Old-Hangul}{KOH}  
174 \newfontlanguage{Konkani}{KOK}  
175 \newfontlanguage{Kikongo}{KON}  
176 \newfontlanguage{Komi-Permyak}{KOP}  
177 \newfontlanguage{Korean}{KOR}  
178 \newfontlanguage{Komi-Zyrian}{KOZ}  
179 \newfontlanguage{Kpelle}{KPL}  
180 \newfontlanguage{Krio}{KRI}  
181 \newfontlanguage{Karakalpak}{KRK}  
182 \newfontlanguage{Karelian}{KRL}  
183 \newfontlanguage{Karaim}{KRM}  
184 \newfontlanguage{Karen}{KRN}  
185 \newfontlanguage{Koorete}{KRT}  
186 \newfontlanguage{Kashmiri}{KSH}  
187 \newfontlanguage{Khasi}{KSI}  
188 \newfontlanguage{Kildin-Sami}{KSM}  
189 \newfontlanguage{Kui}{KUI}  
190 \newfontlanguage{Kulvi}{KUL}  
191 \newfontlanguage{Kumyk}{KUM}  
192 \newfontlanguage{Kurdish}{KUR}  
193 \newfontlanguage{Kurukh}{KUU}  
194 \newfontlanguage{Kuy}{KUY}  
195 \newfontlanguage{Koryak}{KYK}  
196 \newfontlanguage{Ladin}{LAD}  
197 \newfontlanguage{Lahuli}{LAH}

198 \newfontlanguage{Lak}{LAK}  
 199 \newfontlanguage{Lambani}{LAM}  
 200 \newfontlanguage{Lao}{LAO}  
 201 \newfontlanguage{Latin}{LAT}  
 202 \newfontlanguage{Laz}{LAZ}  
 203 \newfontlanguage{L-Cree}{LCR}  
 204 \newfontlanguage{Ladakhi}{LDK}  
 205 \newfontlanguage{Lezgi}{LEZ}  
 206 \newfontlanguage{Lingala}{LIN}  
 207 \newfontlanguage{Low-Mari}{LMA}  
 208 \newfontlanguage{Limbu}{LMB}  
 209 \newfontlanguage{Lomwe}{LMW}  
 210 \newfontlanguage{Lower-Sorbian}{LSB}  
 211 \newfontlanguage{Lule-Sami}{LSM}  
 212 \newfontlanguage{Lithuanian}{LTH}  
 213 \newfontlanguage{Luba}{LUB}  
 214 \newfontlanguage{Luganda}{LUG}  
 215 \newfontlanguage{Luhya}{LUH}  
 216 \newfontlanguage{Luo}{LUO}  
 217 \newfontlanguage{Latvian}{LVI}  
 218 \newfontlanguage{Majang}{MAJ}  
 219 \newfontlanguage{Makua}{MAK}  
 220 \newfontlanguage{Malayalam-Traditional}{MAL}  
 221 \newfontlanguage{Mansi}{MAN}  
 222 \newfontlanguage{Marathi}{MAR}  
 223 \newfontlanguage{Marwari}{MAW}  
 224 \newfontlanguage{Mbundu}{MBN}  
 225 \newfontlanguage{Manchu}{MCH}  
 226 \newfontlanguage{Moose-Cree}{MCR}  
 227 \newfontlanguage{Mende}{MDE}  
 228 \newfontlanguage{Me'en}{MEN}  
 229 \newfontlanguage{Mizo}{MIZ}  
 230 \newfontlanguage{Macedonian}{MKD}  
 231 \newfontlanguage{Male}{MLE}  
 232 \newfontlanguage{Malagasy}{MLG}  
 233 \newfontlanguage{Malinke}{MLN}  
 234 \newfontlanguage{Malayalam-Reformed}{MLR}  
 235 \newfontlanguage{Malay}{MLY}  
 236 \newfontlanguage{Mandinka}{MND}  
 237 \newfontlanguage{Mongolian}{MNG}  
 238 \newfontlanguage{Manipuri}{MNI}  
 239 \newfontlanguage{Maninka}{MNK}  
 240 \newfontlanguage{Manx-Gaelic}{MNX}  
 241 \newfontlanguage{Moksha}{MOK}  
 242 \newfontlanguage{Moldavian}{MOL}  
 243 \newfontlanguage{Mon}{MON}  
 244 \newfontlanguage{Moroccan}{MOR}  
 245 \newfontlanguage{Maori}{MRI}  
 246 \newfontlanguage{Maithili}{MTH}  
 247 \newfontlanguage{Maltese}{MTS}  
 248 \newfontlanguage{Mundari}{MUN}

249 \newfontlanguage{Naga-Assamese}{NAG}  
250 \newfontlanguage{Nanai}{NAN}  
251 \newfontlanguage{Naskapi}{NAS}  
252 \newfontlanguage{N-Cree}{NCR}  
253 \newfontlanguage{Ndebele}{NDB}  
254 \newfontlanguage{Ndonga}{NDG}  
255 \newfontlanguage{Nepali}{NEP}  
256 \newfontlanguage{Newari}{NEW}  
257 \newfontlanguage{Nagari}{NGR}  
258 \newfontlanguage{Norway~House~Cree}{NHC}  
259 \newfontlanguage{Nisi}{NIS}  
260 \newfontlanguage{Niuean}{NIU}  
261 \newfontlanguage{Nkole}{NKL}  
262 \newfontlanguage{N'ko}{NKO}  
263 \newfontlanguage{Dutch}{NLD}  
264 \newfontlanguage{Nogai}{NOG}  
265 \newfontlanguage{Norwegian}{NOR}  
266 \newfontlanguage{Northern-Sami}{NSM}  
267 \newfontlanguage{Northern-Tai}{NTA}  
268 \newfontlanguage{Esperanto}{NTO}  
269 \newfontlanguage{Nynorsk}{NYN}  
270 \newfontlanguage{Oji-Cree}{OCR}  
271 \newfontlanguage{Ojibway}{OBJ}  
272 \newfontlanguage{Oriya}{ORI}  
273 \newfontlanguage{Oromo}{ORO}  
274 \newfontlanguage{Ossetian}{OSS}  
275 \newfontlanguage{Palestinian~Aramaic}{PAA}  
276 \newfontlanguage{Pali}{PAL}  
277 \newfontlanguage{Punjabi}{PAN}  
278 \newfontlanguage{Palpa}{PAP}  
279 \newfontlanguage{Pashto}{PAS}  
280 \newfontlanguage{Polytonic~Greek}{PGR}  
281 \newfontlanguage{Pilipino}{PIL}  
282 \newfontlanguage{Palaung}{PLG}  
283 \newfontlanguage{Polish}{PLK}  
284 \newfontlanguage{Provencal}{PRO}  
285 \newfontlanguage{Portuguese}{PTG}  
286 \newfontlanguage{Chin}{QIN}  
287 \newfontlanguage{Rajasthani}{RAJ}  
288 \newfontlanguage{R-Cree}{RCR}  
289 \newfontlanguage{Russian~Buriat}{RBU}  
290 \newfontlanguage{Riang}{RIA}  
291 \newfontlanguage{Rhaeto-Romanic}{RMS}  
292 \newfontlanguage{Romanian}{ROM}  
293 \newfontlanguage{Romany}{ROY}  
294 \newfontlanguage{Rusyn}{RSY}  
295 \newfontlanguage{Ruanda}{RUA}  
296 \newfontlanguage{Russian}{RUS}  
297 \newfontlanguage{Sadri}{SAD}  
298 \newfontlanguage{Sanskrit}{SAN}  
299 \newfontlanguage{Santali}{SAT}



300 \newfontlanguage{Sayisi}{SAY}  
301 \newfontlanguage{Sekota}{SEK}  
302 \newfontlanguage{Selkup}{SEL}  
303 \newfontlanguage{Sango}{SGO}  
304 \newfontlanguage{Shan}{SHN}  
305 \newfontlanguage{Sibe}{SIB}  
306 \newfontlanguage{Sidamo}{SID}  
307 \newfontlanguage{Silte~Gurage}{SIG}  
308 \newfontlanguage{Skolt~Sami}{SKS}  
309 \newfontlanguage{Slovak}{SKY}  
310 \newfontlanguage{Slavey}{SLA}  
311 \newfontlanguage{Slovenian}{SLV}  
312 \newfontlanguage{Somali}{SML}  
313 \newfontlanguage{Samoan}{SMO}  
314 \newfontlanguage{Sena}{SNA}  
315 \newfontlanguage{Sindhi}{SND}  
316 \newfontlanguage{Sinhalese}{SNH}  
317 \newfontlanguage{Soninke}{SNK}  
318 \newfontlanguage{Sodo~Gurage}{SOG}  
319 \newfontlanguage{Sotho}{SOT}  
320 \newfontlanguage{Albanian}{SQI}  
321 \newfontlanguage{Serbian}{SRB}  
322 \newfontlanguage{Saraiki}{SRK}  
323 \newfontlanguage{Serer}{SRR}  
324 \newfontlanguage{South~Slavey}{SSL}  
325 \newfontlanguage{Southern~Sami}{SSM}  
326 \newfontlanguage{Suri}{SUR}  
327 \newfontlanguage{Svan}{SVA}  
328 \newfontlanguage{Swedish}{SVE}  
329 \newfontlanguage{Swadaya~Aramaic}{SWA}  
330 \newfontlanguage{Swahili}{SWK}  
331 \newfontlanguage{Swazi}{SWZ}  
332 \newfontlanguage{Sutu}{SXT}  
333 \newfontlanguage{Syriac}{SYR}  
334 \newfontlanguage{Tabasaran}{TAB}  
335 \newfontlanguage{Tajiki}{TAJ}  
336 \newfontlanguage{Tamil}{TAM}  
337 \newfontlanguage{Tatar}{TAT}  
338 \newfontlanguage{TH~Cree}{TCR}  
339 \newfontlanguage{Telugu}{TEL}  
340 \newfontlanguage{Tongan}{TGN}  
341 \newfontlanguage{Tigre}{TGR}  
342 \newfontlanguage{Tigrinya}{TGY}  
343 \newfontlanguage{Thai}{THA}  
344 \newfontlanguage{Tahitian}{THT}  
345 \newfontlanguage{Tibetan}{TIB}  
346 \newfontlanguage{Turkish}{TRK, TUR}  
347 \newfontlanguage{Turkmen}{TKM}  
348 \newfontlanguage{Temne}{TMN}  
349 \newfontlanguage{Tswana}{TNA}  
350 \newfontlanguage{Tundra~Nenets}{TNE}

```

351 \newfontlanguage{Tonga}{TNG}
352 \newfontlanguage{Todo}{TOD}
353 \newfontlanguage{Tsonga}{TSG}
354 \newfontlanguage{Turoyo~Aramaic}{TUA}
355 \newfontlanguage{Tulu}{TUL}
356 \newfontlanguage{Tuviv}{TUV}
357 \newfontlanguage{Twii}{TWI}
358 \newfontlanguage{Udmurt}{UDM}
359 \newfontlanguage{Ukrainian}{UKR}
360 \newfontlanguage{Urdu}{URD}
361 \newfontlanguage{Upper~Sorbian}{USB}
362 \newfontlanguage{Uyghur}{UYG}
363 \newfontlanguage{Uzbek}{UZB}
364 \newfontlanguage{Venda}{VEN}
365 \newfontlanguage{Vietnamese}{VIT}
366 \newfontlanguage{Wa}{WA}
367 \newfontlanguage{Wagdi}{WAG}
368 \newfontlanguage{West-Cree}{WCR}
369 \newfontlanguage{Welsh}{WEL}
370 \newfontlanguage{Wolof}{WLF}
371 \newfontlanguage{Tai~Lue}{XBD}
372 \newfontlanguage{Xhosa}{XHS}
373 \newfontlanguage{Yakut}{YAK}
374 \newfontlanguage{Yoruba}{YBA}
375 \newfontlanguage{Y-Cree}{YCR}
376 \newfontlanguage{Yi-Classic}{YIC}
377 \newfontlanguage{Yi-Modern}{YIM}
378 \newfontlanguage{Chinese~Hong~Kong}{ZHH}
379 \newfontlanguage{Chinese~Phonetic}{ZHP}
380 \newfontlanguage{Chinese~Simplified}{ZHS}
381 \newfontlanguage{Chinese~Traditional}{ZHT}
382 \newfontlanguage{Zande}{ZND}
383 \newfontlanguage{Zulu}{ZUL}

```

## File XVII

# fontspec-code-feat-aat.dtx

## 1 AAT feature definitions

These are only defined for X<sub>3</sub>TeX.

### 1.1 Ligatures

```
1 \@@_define_aat_feature_group:n {Ligatures}
2 \@@_define_aat_feature:nmmn {Ligatures} {Required} {1} {0}
3 \@@_define_aat_feature:nmmn {Ligatures} {NoRequired} {1} {1}
4 \@@_define_aat_feature:nmmn {Ligatures} {Common} {1} {2}
5 \@@_define_aat_feature:nmmn {Ligatures} {NoCommon} {1} {3}
6 \@@_define_aat_feature:nmmn {Ligatures} {Rare} {1} {4}
7 \@@_define_aat_feature:nmmn {Ligatures} {NoRare} {1} {5}
8 \@@_define_aat_feature:nmmn {Ligatures} {Discretionary} {1} {4}
9 \@@_define_aat_feature:nmmn {Ligatures} {NoDiscretionary} {1} {5}
10 \@@_define_aat_feature:nmmn {Ligatures} {Logos} {1} {6}
11 \@@_define_aat_feature:nmmn {Ligatures} {NoLogos} {1} {7}
12 \@@_define_aat_feature:nmmn {Ligatures} {Rebus} {1} {8}
13 \@@_define_aat_feature:nmmn {Ligatures} {NoRebus} {1} {9}
14 \@@_define_aat_feature:nmmn {Ligatures} {Diphthong} {1} {10}
15 \@@_define_aat_feature:nmmn {Ligatures} {NoDiphthong} {1} {11}
16 \@@_define_aat_feature:nmmn {Ligatures} {Squared} {1} {12}
17 \@@_define_aat_feature:nmmn {Ligatures} {NoSquared} {1} {13}
18 \@@_define_aat_feature:nmmn {Ligatures} {AbbrevSquared} {1} {14}
19 \@@_define_aat_feature:nmmn {Ligatures} {NoAbbrevSquared} {1} {15}
20 \@@_define_aat_feature:nmmn {Ligatures} {Icelandic} {1} {32}
21 \@@_define_aat_feature:nmmn {Ligatures} {NoIcelandic} {1} {33}
```

Emulate CM extra ligatures.

```
22 \keys_define:nn {fontspec-aat}
23 {
24   Ligatures / TeX .code:n =
25   {
26     \tl_set:Nn \l_@@_mapping_tl { tex-text }
27   }
28 }
```

### 1.2 Letters

```
29 \@@_define_aat_feature_group:n {Letters}
30 \@@_define_aat_feature:nmmn {Letters} {Normal} {3} {0}
31 \@@_define_aat_feature:nmmn {Letters} {Uppercase} {3} {1}
32 \@@_define_aat_feature:nmmn {Letters} {Lowercase} {3} {2}
33 \@@_define_aat_feature:nmmn {Letters} {SmallCaps} {3} {3}
34 \@@_define_aat_feature:nmmn {Letters} {InitialCaps} {3} {4}
```

### 1.3 Numbers

These were originally separated into `NumberCase` and `NumberSpacing` following AAT, but it makes more sense to combine them.

Both naming conventions are offered to select the number case.

```
35 \@@_define_aat_feature_group:n {Numbers}
36 \@@_define_aat_feature:nmmn {Numbers} {Monospaced} {6} {0}
37 \@@_define_aat_feature:nmmn {Numbers} {Proportional} {6} {1}
38 \@@_define_aat_feature:nmmn {Numbers} {Lowercase} {21} {0}
39 \@@_define_aat_feature:nmmn {Numbers} {OldStyle} {21} {0}
40 \@@_define_aat_feature:nmmn {Numbers} {Uppercase} {21} {1}
41 \@@_define_aat_feature:nmmn {Numbers} {Lining} {21} {1}
42 \@@_define_aat_feature:nmmn {Numbers} {SlashedZero} {14} {5}
43 \@@_define_aat_feature:nmmn {Numbers} {NoSlashedZero} {14} {4}
```

### 1.4 Contextuals

```
44 \@@_define_aat_feature_group:n {Contextuals}
45 \@@_define_aat_feature:nmmn {Contextuals} {WordInitial} {8} {0}
46 \@@_define_aat_feature:nmmn {Contextuals} {NoWordInitial} {8} {1}
47 \@@_define_aat_feature:nmmn {Contextuals} {WordFinal} {8} {2}
48 \@@_define_aat_feature:nmmn {Contextuals} {NoWordFinal} {8} {3}
49 \@@_define_aat_feature:nmmn {Contextuals} {LineInitial} {8} {4}
50 \@@_define_aat_feature:nmmn {Contextuals} {NoLineInitial} {8} {5}
51 \@@_define_aat_feature:nmmn {Contextuals} {LineFinal} {8} {6}
52 \@@_define_aat_feature:nmmn {Contextuals} {NoLineFinal} {8} {7}
53 \@@_define_aat_feature:nmmn {Contextuals} {Inner} {8} {8}
54 \@@_define_aat_feature:nmmn {Contextuals} {NoInner} {8} {9}
```

### 1.5 Diacritics

```
55 \@@_define_aat_feature_group:n {Diacritics}
56 \@@_define_aat_feature:nmmn {Diacritics} {Show} {9} {0}
57 \@@_define_aat_feature:nmmn {Diacritics} {Hide} {9} {1}
58 \@@_define_aat_feature:nmmn {Diacritics} {Decompose} {9} {2}
```

### 1.6 Vertical position

```
59 \@@_define_aat_feature_group:n {VerticalPosition}
60 \@@_define_aat_feature:nmmn {VerticalPosition} {Normal} {10} {0}
61 \@@_define_aat_feature:nmmn {VerticalPosition} {Superior} {10} {1}
62 \@@_define_aat_feature:nmmn {VerticalPosition} {Inferior} {10} {2}
63 \@@_define_aat_feature:nmmn {VerticalPosition} {Ordinal} {10} {3}
```

### 1.7 Fractions

```
64 \@@_define_aat_feature_group:n {Fractions}
65 \@@_define_aat_feature:nmmn {Fractions} {On} {11} {1}
66 \@@_define_aat_feature:nmmn {Fractions} {Off} {11} {0}
67 \@@_define_aat_feature:nmmn {Fractions} {Diagonal} {11} {2}
```

### 1.8 Alternate

```
68 \@@_define_aat_feature_group:n { Alternate }
```

```

69 \keys_define:nn {fontspec-aat}
70 {
71   Alternate .default:n = {0} ,
72   Alternate / unknown .code:n =
73     {
74       \clist_map_inline:nn {#1}
75         {
76           \@@_make_AAT_feature:nn {17}{##1}
77         }
78     }
79 }

```

## 1.9 Variant / StylisticSet

```

80 \@@_define_aat_feature_group:n {Variant}
81 \keys_define:nn {fontspec-aat}
82 {
83   Variant .default:n = {0} ,
84   Variant / unknown .code:n =
85     {
86       \clist_map_inline:nn {#1}
87         { \@@_make_AAT_feature:nn {18}{##1} }
88     }
89 }
90 \aliasfontfeature{Variant}{StylisticSet}
91 \@@_define_aat_feature_group:n {Vertical}
92 \keys_define:nn {fontspec-aat}
93 {
94   Vertical .choice: ,
95   Vertical / RotatedGlyphs .code:n =
96     {
97       \__fontspec_update_featstr:n {vertical}
98     }
99 }

```

## 1.10 Style

```

100 \@@_define_aat_feature_group:n {Style}
101 \@@_define_aat_feature:nmnn {Style} {Italic} {32} {2}
102 \@@_define_aat_feature:nmnn {Style} {Ruby} {28} {2}
103 \@@_define_aat_feature:nmnn {Style} {Display} {19} {1}
104 \@@_define_aat_feature:nmnn {Style} {Engraved} {19} {2}
105 \@@_define_aat_feature:nmnn {Style} {Titling} {19} {4}
106 \@@_define_aat_feature:nmnn {Style} {TitlingCaps} {19} {4} % backwards compat
107 \@@_define_aat_feature:nmnn {Style} {TallCaps} {19} {5}

```

## 1.11 CJK shape

```

108 \@@_define_aat_feature_group:n {CJKShape}
109 \@@_define_aat_feature:nmnn {CJKShape} {Traditional} {20} {0}
110 \@@_define_aat_feature:nmnn {CJKShape} {Simplified} {20} {1}
111 \@@_define_aat_feature:nmnn {CJKShape} {JIS1978} {20} {2}
112 \@@_define_aat_feature:nmnn {CJKShape} {JIS1983} {20} {3}

```

```

113 \@@_define_aat_feature:nmmm {CJKShape} {JIS1990} {20} {4}
114 \@@_define_aat_feature:nmmm {CJKShape} {Expert} {20} {10}
115 \@@_define_aat_feature:nmmm {CJKShape} {NLC} {20} {13}

```

## 1.12 Character width

```

116 \@@_define_aat_feature_group:n {CharacterWidth}
117 \@@_define_aat_feature:nmmm {CharacterWidth} {Proportional} {22} {0}
118 \@@_define_aat_feature:nmmm {CharacterWidth} {Full} {22} {1}
119 \@@_define_aat_feature:nmmm {CharacterWidth} {Half} {22} {2}
120 \@@_define_aat_feature:nmmm {CharacterWidth} {Third} {22} {3}
121 \@@_define_aat_feature:nmmm {CharacterWidth} {Quarter} {22} {4}
122 \@@_define_aat_feature:nmmm {CharacterWidth} {AlternateProportional} {22} {5}
123 \@@_define_aat_feature:nmmm {CharacterWidth} {AlternateHalf} {22} {6}
124 \@@_define_aat_feature:nmmm {CharacterWidth} {Default} {22} {7}

```

## 1.13 Annotation

```

125 \@@_define_aat_feature_group:n {Annotation}
126 \@@_define_aat_feature:nmmm {Annotation} {Off} {24} {0}
127 \@@_define_aat_feature:nmmm {Annotation} {Box} {24} {1}
128 \@@_define_aat_feature:nmmm {Annotation} {RoundedBox} {24} {2}
129 \@@_define_aat_feature:nmmm {Annotation} {Circle} {24} {3}
130 \@@_define_aat_feature:nmmm {Annotation} {BlackCircle} {24} {4}
131 \@@_define_aat_feature:nmmm {Annotation} {Parenthesis} {24} {5}
132 \@@_define_aat_feature:nmmm {Annotation} {Period} {24} {6}
133 \@@_define_aat_feature:nmmm {Annotation} {RomanNumerals} {24} {7}
134 \@@_define_aat_feature:nmmm {Annotation} {Diamond} {24} {8}
135 \@@_define_aat_feature:nmmm {Annotation} {BlackSquare} {24} {9}
136 \@@_define_aat_feature:nmmm {Annotation} {BlackRoundSquare} {24} {10}
137 \@@_define_aat_feature:nmmm {Annotation} {DoubleCircle} {24} {11}

```

## File XVIII

# fontspec-code-enc.dtx

## 1 Extended font encodings

### `\EncodingCommand`

```
1 \DeclareDocumentCommand \EncodingCommand { m O{} O{} m }
2 {
3   \bool_if:NF \l_@@_defining_encoding_bool
4     { \@@_error:nn {only-inside-encdef} \EncodingCommand }
5   \DeclareTextCommand{#1}{\UnicodeEncodingName}{#2}[#3]{#4}
6 }
```

*(End of definition for \EncodingCommand. This function is documented on page ??.)*

### `\EncodingAccent`

```
7 \DeclareDocumentCommand \EncodingAccent {mm}
8 {
9   \bool_if:NF \l_@@_defining_encoding_bool
10    { \@@_error:nn {only-inside-encdef} \EncodingAccent }
11   \DeclareTextCommand{#1}{\UnicodeEncodingName}{\add@unicode@accent{#2}}
12 }
```

*(End of definition for \EncodingAccent. This function is documented on page ??.)*

### `\EncodingSymbol`

```
13 \DeclareDocumentCommand \EncodingSymbol {mm}
14 {
15   \bool_if:NF \l_@@_defining_encoding_bool
16     { \@@_error:nn {only-inside-encdef} \EncodingSymbol }
17   \DeclareTextSymbol{#1}{\UnicodeEncodingName}{#2}
18 }
```

*(End of definition for \EncodingSymbol. This function is documented on page ??.)*

### `\EncodingComposite`

```
19 \DeclareDocumentCommand \EncodingComposite {mmm}
20 {
21   \bool_if:NF \l_@@_defining_encoding_bool
22     { \@@_error:nn {only-inside-encdef} \EncodingComposite }
23   \DeclareTextComposite{#1}{\UnicodeEncodingName}{#2}{#3}
24 }
```

*(End of definition for \EncodingComposite. This function is documented on page ??.)*

### `\EncodingCompositeCommand`

```
25 \DeclareDocumentCommand \EncodingCompositeCommand {mmm}
26 {
27   \bool_if:NF \l_@@_defining_encoding_bool
28     { \@@_error:nn {only-inside-encdef} \EncodingCompositeCommand }
29   \DeclareTextCompositeCommand{#1}{\UnicodeEncodingName}{#2}{#3}
30 }
```

(End of definition for `\EncodingCompositeCommand`. This function is documented on page ??.)

`\DeclareUnicodeEncoding`

```
31 \DeclareDocumentCommand \DeclareUnicodeEncoding {mm}
32 {
33   \DeclareFontEncoding{#1}{-}{-}
34   \DeclareFontSubstitution{#1}{lmr}{m}{n}
35   \DeclareFontFamily{#1}{lmr}{-}
36
37   \DeclareFontShape{#1}{lmr}{m}{n}
38     {<->\UnicodeFontFile{lmroman10-regular}{\UnicodeFontTeXLigatures}}{-}
39   \DeclareFontShape{#1}{lmr}{m}{it}
40     {<->\UnicodeFontFile{lmroman10-italic}{\UnicodeFontTeXLigatures}}{-}
41   \DeclareFontShape{#1}{lmr}{m}{sc}
42     {<->\UnicodeFontFile{lmromancaps10-regular}{\UnicodeFontTeXLigatures}}{-}
43   \DeclareFontShape{#1}{lmr}{bx}{n}
44     {<->\UnicodeFontFile{lmroman10-bold}{\UnicodeFontTeXLigatures}}{-}
45   \DeclareFontShape{#1}{lmr}{bx}{it}
46     {<->\UnicodeFontFile{lmroman10-bolditalic}{\UnicodeFontTeXLigatures}}{-}
47
48   \tl_set_eq:NN \l_@@_prev_unicode_name_tl \UnicodeEncodingName
49   \tl_set:Nn \UnicodeEncodingName {#1}
50   \bool_set_true:N \l_@@_defining_encoding_bool
51   #2
52   \bool_set_false:N \l_@@_defining_encoding_bool
53   \tl_set_eq:NN \UnicodeEncodingName \l_@@_prev_unicode_name_tl
54 }
```

(End of definition for `\DeclareUnicodeEncoding`. This function is documented on page ??.)

`\UndeclareSymbol` Synonyms for each other but all included for completeness.

`\UndeclareAccent`  
`\UndeclareCommand`

```
55 \DeclareDocumentCommand \UndeclareSymbol {m}
56 {
57   \bool_if:NF \l_@@_defining_encoding_bool
58     { \@@_error:nn {only-inside-encdef} \UndeclareSymbol }
59   \UndeclareTextCommand {#1} {\UnicodeEncodingName}
60 }
61 \DeclareDocumentCommand \UndeclareAccent {m}
62 {
63   \bool_if:NF \l_@@_defining_encoding_bool
64     { \@@_error:nn {only-inside-encdef} \UndeclareAccent }
65   \UndeclareTextCommand {#1} {\UnicodeEncodingName}
66 }
67 \DeclareDocumentCommand \UndeclareCommand {m}
68 {
69   \bool_if:NF \l_@@_defining_encoding_bool
70     { \@@_error:nn {only-inside-encdef} \UndeclareCommand }
71   \UndeclareTextCommand {#1} {\UnicodeEncodingName}
72 }
```

(End of definition for `\UndeclareSymbol`, `\UndeclareAccent`, and `\UndeclareCommand`. These functions are documented on page ??.)



## `\UndeclareComposite`

```
73 \DeclareDocumentCommand \UndeclareComposite {mm}
74 {
75   \bool_if:NF \l_@@_defining_encoding_bool
76   { \@@_error:nn {only-inside-encdef} \UndeclareComposite }
77   \cs_undefine:c
78   { \c_backslash_str \UnicodeEncodingName \token_to_str:N #1 - \tl_to_str:n {#2} }
79 }
```

*(End of definition for \UndeclareComposite. This function is documented on page ??.)*

## File XIX

# fontspec-code-math.dtx

## 1 Selecting maths fonts

Here, the fonts used in math mode are redefined to correspond to the default roman, sans serif and typewriter fonts. Unfortunately, you can only define maths fonts in the preamble, otherwise I'd run this code whenever `\setmainfont` and friends was run.

`\fontspec_setup_maths:` Everything here is performed `\AtBeginDocument` in order to overwrite euler's attempt. This means fontspec must be loaded *after* euler. We set up a conditional to return an error if this rule is violated.

Since every maths setup is slightly different, we also take different paths for defining various math glyphs depending which maths font package has been loaded.

```
1 \ifpackageloaded{euler}
2   { \bool_gset_true:N \g_@@_pkg_euler_loaded_bool }
3   { \bool_gset_false:N \g_@@_pkg_euler_loaded_bool }
4 \cs_new:Nn \fontspec_setup_maths:
5   {
6     \ifpackageloaded{euler}
7       {
8         \bool_if:NTF \g_@@_pkg_euler_loaded_bool
9           { \bool_gset_true:N \g_@@_math_euler_bool }
10          { \@@_error:n {euler-too-late} }
11        }
12      {}
13 \ifpackageloaded{lucbmath}{ \bool_gset_true:N \g_@@_math_lucida_bool }{}
14 \ifpackageloaded{lucidabr}{ \bool_gset_true:N \g_@@_math_lucida_bool }{}
15 \ifpackageloaded{lucimatx}{ \bool_gset_true:N \g_@@_math_lucida_bool }{}

```

Knuth's CM fonts are all squashed together, combining letters, accents, text symbols and maths symbols all in the one font, `cmr`, plus other things in other fonts. Because we are changing the roman font in the document, we need to redefine all of the maths glyphs in  $\TeX$ 's `operators` maths font to still go back to the legacy `cmr` font for all these random glyphs, unless a separate maths font package has been loaded instead.

In every case, the maths accents are always taken from the `operators` font, which is generally the main text font. (Actually, there is a `\hat` accent in `EulerFraktur`, but it's *ugly*. So I ignore it. Sorry if this causes inconvenience.)

```
16 \DeclareSymbolFont{legacymaths}{OT1}{cmr}{m}{n}
17 \SetSymbolFont{legacymaths}{bold}{OT1}{cmr}{bx}{n}
18 \DeclareMathAccent{\acute}    {\mathalpha}{legacymaths}{19}
19 \DeclareMathAccent{\grave}   {\mathalpha}{legacymaths}{18}
20 \DeclareMathAccent{\ddot}    {\mathalpha}{legacymaths}{127}
21 \DeclareMathAccent{\tilde}   {\mathalpha}{legacymaths}{126}
22 \DeclareMathAccent{\bar}     {\mathalpha}{legacymaths}{22}
23 \DeclareMathAccent{\breve}   {\mathalpha}{legacymaths}{21}
24 \DeclareMathAccent{\check}   {\mathalpha}{legacymaths}{20}
25 \DeclareMathAccent{\hat}     {\mathalpha}{legacymaths}{94} % too bad, euler

```

```

26 \DeclareMathAccent{\dot}      {\mathalpha}{legacymaths}{95}
27 \DeclareMathAccent{\mathring}{\mathalpha}{legacymaths}{23}

```

`\colon`: what's going on? Okay, so `:` and `\colon` in maths mode are defined in a few places, so I need to work out what does what. Respectively, we have:

```

% % fontmath.ltx:
% \DeclareMathSymbol{\colon}{\mathpunct}{operators}{"3A}
% \DeclareMathSymbol{:}{\mathrel}{operators}{"3A}
%
% % amsmath.sty:
% \renewcommand{\colon}{\nobreak\mskip2mu\mathpunct{}\nonscript
% \mkern-\thinmuskip{:}\mskip6mu\relax}
%
% % euler.sty:
% \DeclareMathSymbol{:}{\mathrel}{EulerFraktur}{"3A}
%
% % lucbmath.sty:
% \DeclareMathSymbol{\@tempb}{\mathpunct}{operators}{58}
% \ifx\colon\@tempb
% \DeclareMathSymbol{\colon}{\mathpunct}{operators}{58}
% \fi
% \DeclareMathSymbol{:}{\mathrel}{operators}{58}

```

(3A<sub>16</sub> = 58<sub>10</sub>) So I think, based on this summary, that it is fair to tell fontspec to 'replace' the operators font with legacymaths for this symbol, except when amsmath is loaded since we want to keep its definition.

```

28 \group_begin:
29 \mathchardef\@tempa="603A \relax
30 \ifx\colon\@tempa
31 \DeclareMathSymbol{\colon}{\mathpunct}{legacymaths}{58}
32 \fi
33 \group_end:

```

The following symbols are only defined specifically in euler, so skip them if that package is loaded.

```

34 \bool_if:NF \g_@@_math_euler_bool
35 {
36 \DeclareMathSymbol{!}{\mathclose}{legacymaths}{33}
37 \DeclareMathSymbol{:}{\mathrel}{legacymaths}{58}
38 \DeclareMathSymbol{;}{\mathpunct}{legacymaths}{59}
39 \DeclareMathSymbol{?}{\mathclose}{legacymaths}{63}

```

And these ones are defined both in euler and lucbmath, so we only need to run this code if no extra maths package has been loaded.

```

40 \bool_if:NF \g_@@_math_lucida_bool
41 {
42 \DeclareMathSymbol{0}{\mathalpha}{legacymaths}{`0}
43 \DeclareMathSymbol{1}{\mathalpha}{legacymaths}{`1}
44 \DeclareMathSymbol{2}{\mathalpha}{legacymaths}{`2}

```

```

45 \DeclareMathSymbol{3}{\mathalpha}{legacymaths}{`3}
46 \DeclareMathSymbol{4}{\mathalpha}{legacymaths}{`4}
47 \DeclareMathSymbol{5}{\mathalpha}{legacymaths}{`5}
48 \DeclareMathSymbol{6}{\mathalpha}{legacymaths}{`6}
49 \DeclareMathSymbol{7}{\mathalpha}{legacymaths}{`7}
50 \DeclareMathSymbol{8}{\mathalpha}{legacymaths}{`8}
51 \DeclareMathSymbol{9}{\mathalpha}{legacymaths}{`9}
52 \DeclareMathSymbol{\Gamma}{\mathalpha}{legacymaths}{0}
53 \DeclareMathSymbol{\Delta}{\mathalpha}{legacymaths}{1}
54 \DeclareMathSymbol{\Theta}{\mathalpha}{legacymaths}{2}
55 \DeclareMathSymbol{\Lambda}{\mathalpha}{legacymaths}{3}
56 \DeclareMathSymbol{\Xi}{\mathalpha}{legacymaths}{4}
57 \DeclareMathSymbol{\Pi}{\mathalpha}{legacymaths}{5}
58 \DeclareMathSymbol{\Sigma}{\mathalpha}{legacymaths}{6}
59 \DeclareMathSymbol{\Upsilon}{\mathalpha}{legacymaths}{7}
60 \DeclareMathSymbol{\Phi}{\mathalpha}{legacymaths}{8}
61 \DeclareMathSymbol{\Psi}{\mathalpha}{legacymaths}{9}
62 \DeclareMathSymbol{\Omega}{\mathalpha}{legacymaths}{10}
63 \DeclareMathSymbol{+}{\mathbin}{legacymaths}{43}
64 \DeclareMathSymbol{=}{\mathrel}{legacymaths}{61}
65 \DeclareMathDelimiter{()}{\mathopen}{legacymaths}{40}{largesymbols}{0}
66 \DeclareMathDelimiter{)}{\mathclose}{legacymaths}{41}{largesymbols}{1}
67 \DeclareMathDelimiter{[}{\mathopen}{legacymaths}{91}{largesymbols}{2}
68 \DeclareMathDelimiter{]}{\mathclose}{legacymaths}{93}{largesymbols}{3}
69 \DeclareMathDelimiter{/}{\mathord}{legacymaths}{47}{largesymbols}{14}
70 \DeclareMathSymbol{\mathdollar}{\mathord}{legacymaths}{36}
71 \renewcommand{\hbar}{\mathchar"AF\mkern-9mu h}}% TODO: test with other fonts
72 }
73 }

```

Finally, we change the font definitions for `\mathrm` and so on. These are defined using the `\g_@@_mathrm_tl(...)` macros, which default to `\rmdefault` but may be specified with the `\setmathrm(...)` commands in the preamble.

Since L<sup>A</sup>T<sub>E</sub>X only generally defines one level of boldness, we omit `\mathbf` in the bold maths series. It can be specified as per usual with `\setboldmathrm`, which stores the appropriate family name in `\g_@@_bfmathrm_tl`.

```

74 \DeclareSymbolFont{operators}\g_fontspec_encoding_tl\g_@@_mathrm_tl\mddefault\shapedefault
75 \SetSymbolFont{operators}{normal}\g_fontspec_encoding_tl\g_@@_mathrm_tl\mddefault\shapedefault
76 \DeclareSymbolFontAlphabet\mathrm{operators}
77 \SetMathAlphabet\mathit{normal}\g_fontspec_encoding_tl\g_@@_mathrm_tl\mddefault\itdefault
78 \SetMathAlphabet\mathbf{normal}\g_fontspec_encoding_tl\g_@@_mathrm_tl\bfdefault\shapedefault
79 \SetMathAlphabet\mathsf{normal}\g_fontspec_encoding_tl\g_@@_mathsf_tl\mddefault\shapedefault
80 \SetMathAlphabet\mathtt{normal}\g_fontspec_encoding_tl\g_@@_mathtt_tl\mddefault\shapedefault
81 \SetSymbolFont{operators}{bold}\g_fontspec_encoding_tl\g_@@_mathrm_tl\bfdefault\shapedefault
82 \tl_if_empty:NTF \g_@@_bfmathrm_tl
83 {
84   \SetMathAlphabet\mathit{bold}\g_fontspec_encoding_tl\g_@@_mathrm_tl\bfdefault\itdefault
85 }
86 {
87   \SetMathAlphabet\mathrm{bold}\g_fontspec_encoding_tl\g_@@_bfmathrm_tl\mddefault\shapedefault
88   \SetMathAlphabet\mathbf{bold}\g_fontspec_encoding_tl\g_@@_bfmathrm_tl\bfdefault\shapedefault

```

```

89   \SetMathAlphabet\mathit{bold}\g_fontspec_encoding_tl\g_@@_bfmathrm_tl\mdefault\itdefault
90   }
91   \SetMathAlphabet\mathsf{bold}\g_fontspec_encoding_tl\g_@@_mathsf_tl\bfdefault\shapedefault
92   \SetMathAlphabet\mathtt{bold}\g_fontspec_encoding_tl\g_@@_mathtt_tl\bfdefault\shapedefault
93   }

```

(End of definition for `\fontspec_setup_maths`:. This function is documented on page ??.)

`\fontspec_maybe_setup_maths`: We're a little less sophisticated about not executing the maths setup if various other maths font packages are loaded. This list is based on the wonderful 'L<sup>A</sup>T<sub>E</sub>X Font Catalogue': <http://www.tug.dk/FontCatalogue/mathfonts.html>. I'm sure there are more I've missed. Do the T<sub>E</sub>X Gyre fonts have maths support yet?

Untested: would `\unless\ifnum\Gamma=28672\relax\bool_set_false:N \g_@@_math_bool\fi` be a better test? This needs more cooperation with euler and lucida, I think.

```

94 \cs_new:Nn \fontspec_maybe_setup_maths:
95 {
96   \@ifpackageloaded{anttor}
97   {
98     \ifx\define@antt@mathversions a\bool_gset_false:N \g_@@_math_bool\fi
99   }{}
100  \@ifpackageloaded{arevmath}      {\bool_gset_false:N \g_@@_math_bool}{}
101  \@ifpackageloaded{eulervm}      {\bool_gset_false:N \g_@@_math_bool}{}
102  \@ifpackageloaded{mathdesign}    {\bool_gset_false:N \g_@@_math_bool}{}
103  \@ifpackageloaded{concmath}     {\bool_gset_false:N \g_@@_math_bool}{}
104  \@ifpackageloaded{cmbright}     {\bool_gset_false:N \g_@@_math_bool}{}
105  \@ifpackageloaded{mathesf}      {\bool_gset_false:N \g_@@_math_bool}{}
106  \@ifpackageloaded{gfsartemisia} {\bool_gset_false:N \g_@@_math_bool}{}
107  \@ifpackageloaded{gfsneohellenic} {\bool_gset_false:N \g_@@_math_bool}{}
108  \@ifpackageloaded{iwona}
109  {
110    \ifx\define@iwona@mathversions a\bool_set_false:N \g_@@_math_bool\fi
111  }{}
112  \@ifpackageloaded{kpfonts}{\bool_gset_false:N \g_@@_math_bool}{}
113  \@ifpackageloaded{kmath}  {\bool_gset_false:N \g_@@_math_bool}{}
114  \@ifpackageloaded{kurier}
115  {
116    \ifx\define@kurier@mathversions a\bool_set_false:N \g_@@_math_bool\fi
117  }{}
118  \@ifpackageloaded{fouriernc}  {\bool_gset_false:N \g_@@_math_bool}{}
119  \@ifpackageloaded{fourier}   {\bool_gset_false:N \g_@@_math_bool}{}
120  \@ifpackageloaded{lmodern}   {\bool_gset_false:N \g_@@_math_bool}{}
121  \@ifpackageloaded{mathpazo}  {\bool_gset_false:N \g_@@_math_bool}{}
122  \@ifpackageloaded{mathptmx}  {\bool_gset_false:N \g_@@_math_bool}{}
123  \@ifpackageloaded{MinionPro} {\bool_gset_false:N \g_@@_math_bool}{}
124  \@ifpackageloaded{unicode-math} {\bool_gset_false:N \g_@@_math_bool}{}
125  \@ifpackageloaded{breqn}     {\bool_gset_false:N \g_@@_math_bool}{}
126  \@ifpackageloaded{pxfonts}   {\bool_gset_false:N \g_@@_math_bool}{}
127  \@ifpackageloaded{txfonts}   {\bool_gset_false:N \g_@@_math_bool}{}
128  \@ifpackageloaded{newpxmath} {\bool_gset_false:N \g_@@_math_bool}{}
129  \@ifpackageloaded{newtxmath} {\bool_gset_false:N \g_@@_math_bool}{}
130  \@ifpackageloaded{mtpro2}   {\bool_gset_false:N \g_@@_math_bool}{}

```

```
131 \bool_if:NT \g_@@_math_bool
132 {
133   \@@_info:n {setup-math}
134   \fontspec_setup_maths:
135 }
136 }
137 \AtBeginDocument{\fontspec_maybe_setup_maths:}
```

*(End of definition for \fontspec\_maybe\_setup\_maths:. This function is documented on page ??.)*

File XX

## fontspec-code-closing.dtx

### 1 Closing code

#### 1.1 Finishing up

Now we just want to set up loading the .cfg file, if it exists.

```
1 \bool_if:NT \g_@@_cfg_bool
2   {
3     \InputIfFileExists{fontspec.cfg}
4     {}
5     { \typeout{No~ fontspec.cfg~ file~ found;~ no~ configuration~ loaded.} }
6   }
```

## File XXI

# fontspec-code-xfss.dtx

## 1 Changes/additions to the NFSS

---

`\strong`    `\strong {<text>}`  
`\strongenv` `\begin{strongenv} <text> \end{strongenv}`

Typesets text in the ‘strong’ font. NFSS series equivalent to `\emph`. Can be nested.

---

`\strongfontdeclare` `\strongfontdeclare {<comma-separated font switch declarations>}`

Define the behaviour of nested `\strong` commands.

---

`\strongreset` `\renewcommand \strongreset {<font switch declarations>}`

Define the behaviour when a `\strong` command is nested deeper than the definitions provided by `\strongfontdeclare`. By default this is *empty* — i.e., bold on top of bold remains bold. In certain circumstances it may be appropriate to reset to a default state.

## 2 Implementation

1 `<*fontspec>`

### 2.1 Italic small caps and so on

2 `\providecommand*\scitdefault{\scdefault\itdefault}`  
3 `\providecommand*\scsldefault{\scdefault\sldefault}`  
4 `\providecommand*\scswdefault{\scdefault\swdefault}`

TeX’s ‘shape’ font axis needs to be overloaded to support italic small caps and slanted small caps. These are the combinations to support:

5 `\cs_new:Nn \@@_shape_merge:nn { c_@@_shape_#1_#2_tl }`  
6 `\cs_new:Nn \@@_merge_default_shapes:`  
7    `{`  
8     `\tl_const:cn { \@@_shape_merge:nn \shapedefault\scdefault } {\scdefault}`  
9     `\tl_const:cn { \@@_shape_merge:nn \itdefault \scdefault } {\scitdefault}`  
10    `\tl_const:cn { \@@_shape_merge:nn \sldefault \scdefault } {\scsldefault}`  
11    `\tl_const:cn { \@@_shape_merge:nn \swdefault \scdefault } {\scswdefault}`  
12    `\tl_const:cn { \@@_shape_merge:nn \scdefault \itdefault } {\scitdefault}`  
13    `\tl_const:cn { \@@_shape_merge:nn \scdefault \sldefault } {\scsldefault}`  
14    `\tl_const:cn { \@@_shape_merge:nn \scdefault \swdefault } {\scswdefault}`  
15    `\tl_const:cn { \@@_shape_merge:nn \scsldefault \itdefault } {\scitdefault}`  
16    `\tl_const:cn { \@@_shape_merge:nn \scitdefault \sldefault } {\scsldefault}`  
17    `\tl_const:cn { \@@_shape_merge:nn \scitdefault \shapedefault } {\scdefault}`  
18    `\tl_const:cn { \@@_shape_merge:nn \scsldefault \shapedefault } {\scdefault}`  
19    `}`  
20 `\@@_merge_default_shapes:`



The following is rather specific; it only returns true if the merged shape exists, but more importantly also if the merged shape is defined for the current font.

```

21 \prg_new_conditional:Nnn \@@_if_merge_shape:n {TF}
22 {
23   \bool_lazy_and:nnTF
24     { \tl_if_exist_p:c { \@@_shape_merge:nn {\f@shape} {#1} } }
25     {
26       \cs_if_exist_p:c
27         {
28           \f@encoding/\f@family/\f@series/
29           \tl_use:c { \@@_shape_merge:nn {\f@shape} {#1} }
30         }
31     }
32   \prg_return_true: \prg_return_false:
33 }
34 \cs_set_eq:NN \emfontdeclare \DeclareEmphSequence

```

## 2.2 Strong emphasis

`\strongfontdeclare`

```

35 \cs_set_protected:Npn \strongfontdeclare #1
36 {
37   \prop_gclear:N \g_@@_strong_prop
38   \int_zero:N \l_@@_strongdef_int
39
40   \group_begin:
41     \normalfont
42     \clist_map_inline:nn {\strongreset,#1}
43     {
44       ##1
45       \prop_gput_if_not_in:NeV \g_@@_strong_prop { \f@series } { \l_@@_strongdef_int }
46       \prop_gput:Nen \g_@@_strong_prop { switch-\int_use:N \l_@@_strongdef_int } { ##1 }
47       \int_incr:N \l_@@_strongdef_int
48     }
49   \group_end:
50 }

```

(End of definition for `\strongfontdeclare`. This function is documented on page 128.)

`\strongenv`

```

51 \DeclareRobustCommand \strongenv
52 {
53   \@nomath\strongenv
54
55   <debug> \typeout{Strong~ level:~\int_use:N \l_@@_strong_int}
56   \prop_get:NeNT \g_@@_strong_prop { \f@series } \l_@@_strong_tmp_tl
57   {
58     \int_set:Nn \l_@@_strong_int { \l_@@_strong_tmp_tl }
59   <debug> \typeout{Series~ (\f@series)~ detected;~ new~ level:~\int_use:N \l_@@_strong_int}
60   }
61
62   \int_incr:N \l_@@_strong_int

```

```

63
64   \prop_get:NeNTF \g_@@_strong_prop { switch-\int_use:N \l_@@_strong_int } \l_@@_strong_swit
65   { \l_@@_strong_switch_tl }
66   {
67     \int_zero:N \l_@@_strong_int
68     \strongreset
69   }
70
71 }

```

*(End of definition for \strongenv. This function is documented on page 128.)*

### **\strong**

```

72 \DeclareTextFontCommand{\strong}{\strongenv}

```

*(End of definition for \strong. This function is documented on page 128.)*

### **\strongreset**

```

73 \cs_set:Npn \strongreset {}

```

*(End of definition for \strongreset. This function is documented on page 128.)*

**\reset@font** Ensure nesting resets when necessary:

```

74 \cs_set_protected:Npn \reset@font
75   {
76     \normalfont
77     \int_zero:N \l_@@_strong_int
78   }

```

*(End of definition for \reset@font.)*

## **2.3 Defaults**

```

79 \strongfontdeclare{\bfseries}

```

```

80 </fontspec>

```

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