



# Kazuraki®: Under The Hood

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# Why Develop Kazuraki?

- To build excitement and awareness about OpenType® Japanese fonts
  - Kazuraki is the first fully-proportional OpenType Japanese font
- To demonstrate OpenType layout capabilities of Adobe® applications
- To guide other type foundries to design and develop comparable fonts
  - The interest is not only in Japan, but extends to other East Asian countries
  - Kazuraki serves as an inspiration and model for other type foundries
  - Adobe Tech Note #5901 was specifically authored for this purpose
- To expose poor assumptions in applications and font development tools
  - So that they can be identified then subsequently fixed

# The Problem: Non-Standard Glyph Set

- Virtually all glyphs require separate vertical forms
  - The glyphs may be identical, but shifting and metrics necessitate separate glyphs
  - For a very small number of glyphs, there are only vertical forms
- Specialized glyphs
  - Two-, three-, and four-character vertical hiragana ligatures
- Conclusion: Kazuraki does not “fit” the Adobe-Japan1-x ROS (glyph set)
  - “ROS” is an abbreviation for the three /CIDSystemInfo dictionary elements
    - /Registry, /Ordering & /Supplement
  - The Adobe-Japan1-x ROS is the industry standard for OpenType Japanese fonts

# The Solution: The Special-Purpose Adobe-Identity-0 ROS

- A dynamic, locale-unspecific special-purpose glyph set
  - Specified in the /CIDSystemInfo dictionary
- Locale and language are specified via other attributes in the OpenType font
  - Via the 'OS/2' and 'name' tables

# OpenType Implementation Details

- Two very important goals
  1. Proportional metrics are the default—‘palt’ and ‘vpal’ GPOS features are not used
  2. Vertical hiragana ligatures are “on” by default
- Solutions
  - Proportional metrics are specified as default in standard OpenType tables
    - ‘hmtx’ and ‘vmtx’
  - Vertical hiragana ligatures are accessible via the ‘liga’ GSUB feature
- GSUB feature lookup ordering is important
  - ‘vert’ (and ‘vrt2’) before ‘liga’
  - Clients—OSes, applications, and libraries—must respect feature lookup ordering
- Serves as an example for other type foundries to follow
  - The production techniques are described and detailed in Adobe Tech Note #5901
    - Includes Japanese and Chinese translations

# OpenType Production Process

- The data is first built as an intermediate OpenType font with standard features
  - The glyphs are optically centered within the 1000×1000 em-box
    - With mono-spaced 1000-unit horizontal and vertical advances
  - The 'palt' and 'vpal' GPOS features provide shifting values and new widths
    - The horizontal and vertical glyphs require X- and Y-axis shifting, respectively
- Intermediate glyphs are named according to Adobe-Japan1-x CIDs
  - In order to leverage existing Adobe-Japan1-x resources
    - UTF-32 CMap resource and GSUB features
  - Ligatures were named as sequences of Adobe-Japan1-x CIDs
- Proportional Latin glyphs were added
  - Briosio Pro Semibold Display scaled to 108%

# OpenType Production Process (cont'd)

- An elaborate Perl script was used to process the data
  - The separate vertical glyphs were created by an AFDKO *mergeFonts* tool mapping file
  - The 'palt' (horizontal) GPOS metrics were converted to AFDKO *rotateFont* tool directives
    - X-axis shifting and new horizontal advances
  - The 'vpal' (vertical) GPOS metrics were converted to 'vmtx' table overrides
    - Y-axis shifting and new vertical advances
  - The Unicode CMap resource, for generating the 'cmap' table, was automatically created
    - Adobe-Japan1-x CIDs were used to leverage existing UTF-32 CMap resources
  - The 'vert' and 'liga' GSUB features were automatically created
- The same Perl script was used for the production of all three versions
  - Prototype—1,223 glyphs (297 kanji, 17 vertical hiragana ligatures)
  - Version 1—2,973 glyphs (1,082 kanji, 50 vertical hiragana ligatures)—*shipped*
  - Version 2—3,776 glyphs (1,483 kanji, 51 vertical hiragana ligatures)—*shipping*

# Horizontal & Vertical Metrics: U+5FC5 必

- Kazuraki sources



- Final Kazuraki glyph—CIDs 1531 (horizontal) and 3390 (vertical)



- Horizontal metrics directives—recorded in 'CFF' and 'hmtx' tables
  - 1,376-unit advance—wide
  - 154-unit right shift
- Vertical metrics directives—recorded in 'vmtx' table
  - 835-unit advance—short
  - 125-unit upward shift



## Horizontal & Vertical Metrics: U+5FC5 𐄥 (cont'd)

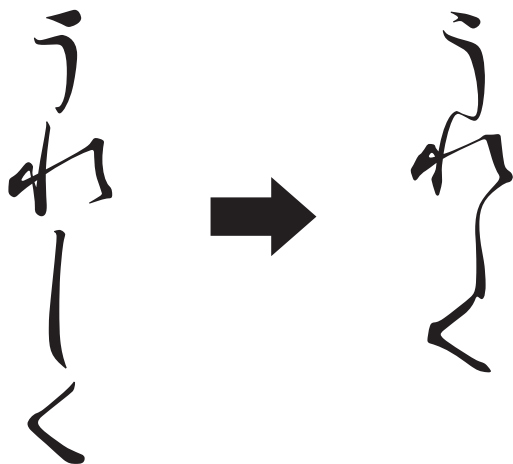
- Two *mergeFonts* mapping files—establishes the Adobe-Identity-0 CIDs
  - Horizontal  
**1531** CID3486
  - Vertical  
**3390** CID3486
- One *rotateFont* mapping file—proportional horizontal glyph  
1531 1531 **1376 154** 0  
3390 3390 None 0 0
- The 'vmtx' table overrides in the "features" file—proportional vertical glyph  
VertOriginY \3390 **755**; # 880 - 125  
VertAdvanceY \3390 **835**;

## Horizontal & Vertical Metrics: U+5FC5 𠂇 (cont'd)



# Vertical Hiragana Ligature Metrics

- Final Kazuraki glyph: CID+3730 (vertical only) うれしく (*ureshiku*)



- Horizontal metrics directives—recorded in 'CFF' and 'hmtx' tables (unused)
  - Default advance (1000 units)
  - No shift
- Vertical metrics directives—recorded in 'vmtx' table
  - 3,219-unit advance—*very* tall
  - 1,119-unit downward shift

## Vertical Hiragana Ligature Metrics (cont'd)

- One *mergeFonts* mapping file—establishes the Adobe-Identity-0 CID  
**3730** CID847CID917CID864CID856v
- One *rotateFont* mapping file—no metrics changes  
3730 3730 None 0 0
- The 'vmtx' table overrides in the "features" file—proportional vertical glyph  
VertOriginY \3730 **1999**; # 880 + 1,119  
VertAdvanceY \3730 **3219**;

# Vertical Considerations

- Small kana and punctuation require separate vertical forms in standard fonts
  - They are repositioned, rotated, or rotated+flipped
- Kazuraki requires separate vertical forms for *all* kana, kanji, and punctuation
  - The glyphs are otherwise identical
- Why are separate vertical forms necessary?
  - The genuine proportional nature of the design necessitates X- *and* Y-axis shifting
    - Horizontal requires X-axis shifting
    - Vertical required Y-axis shifting
  - The OpenType table that records default vertical metrics does not support X-axis shifts
    - The 'vmtx' table can record only vertical widths and Y-axis shifts
- Thanks to subroutinization, the difference in filesize is minimal
  - The AFDKO *makeotf* tool, an OpenType font compiler, applies subroutinization by default

# Glyph Set Details

- All kana—hiragana and katakana
- Punctuation and symbols
- A total of 51 two-, three-, and four-character vertical hiragana ligatures
- 1,483 kanji
  - All 1,006 Gakushū Kanji (学習漢字) are included
- Proportional Latin
  - 150 glyphs from Briosio Pro Semibold Display, scaled to 108%
- 3,776 total glyphs—CIDs 0 through 3775
  - CIDs 1 through 1863: horizontal glyphs (Latin, punctuation, symbols, kana, and kanji)
  - CIDs 1864 through 3722: vertical forms of CIDs 1 through 1863
  - CIDs 3723 through 3775: vertical hiragana ligatures and kana iteration marks

# Useful URLs

- AFDKO

*<http://www.adobe.com/devnet/opentype/afdko.html>*

- Adobe Type Showroom

*<http://www.adobe.com/type/>*

- Adobe's CJK Type Blog

*<http://blogs.adobe.com/CCJKType/>*

- Adobe Tech Note #5901

*[http://www.adobe.com/devnet/font/pdfs/5901.Kazuraki\\_Tutorial.pdf](http://www.adobe.com/devnet/font/pdfs/5901.Kazuraki_Tutorial.pdf)*

- OpenType Specification

*<http://www.microsoft.com/typography/otspec/>*



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