Source Han Serif Version 1.001

Built on May 1, 2017 • Released on May 8, 2017

Overview

Source Han Serif, designed by Ryoko Nishizuka (西塚涼子), is the companion serif-style Pan-CJK typeface family to Source Han Sans, and is offered in seven slightly different weights—ExtraLight, Light, Regular, Medium, SemiBold, Bold, and Heavy—and in several OpenType/CFF-based deployment configurations to accommodate various system requirements or, in some cases, limitations. Pan-CJK fonts, such as those provided in the Source Han typeface families, are intended to support and render the most important characters for Simplified Chinese, Traditional Chinese, Japanese, and Korean.

The samples on this page demonstrate that the differences for each language can be subtle or striking, depending on the ideograph, yet they all clearly share the same typeface design, weight, and other characteristics that are not necessarily tied to a particular language.

The first sample shows the completely shared form of U+4E00, along with the shared Simplified/Traditional Chinese and shared Japanese/Korean forms of U+5B57:

The second sample below shows, from left to right, the Simplified Chinese, Traditional Chinese, and shared Japanese/Korean forms of U+597D:

The third sample shows, again from left to right, the completely unshared Simplified Chinese, Traditional Chinese, Japanese, and Korean forms of U+677E:

The following short passage is Genesis 11:1 (创世记 11:1 in Simplified Chinese, 創世記 11:1 in Traditional Chinese, 創世記 11:1 in Japanese, and 창세기 11:1 in Korean) shown in three of the seven weights:

ExtraLight

Now the whole world had one language and a common speech.
那时，天下人的口音、言语都是一样。
那時，天下人的口音、言語都是一樣。
全地は同じ発音、同じ言葉であった。
온 땅의 구음이 하나이요 언어가 하나이었더라.

Regular

Now the whole world had one language and a common speech.
那时，天下人的口音、言语都是一样。
那時，天下人的口音、言語都是一樣。
全地は同じ発音、同じ言葉であった。
온 땅의 구음이 하나이요 언어가 하나이었더라.

Heavy

Now the whole world had one language and a common speech.
那时，天下人的口音、言语都是一样。
那時，天下人的口音、言語都是一樣。
全地は同じ発音、同じ言葉であった。
온 땅의 구음이 하나이요 언어가 하나이었더라.

The pages that follow provide excruciating technical details about the font resources that are included in this open source project, and the information corresponds to Version 1.001.

Configurations

Source Han Serif is provided in four basic deployment configurations, each of which is described below, along with typical usage scenarios:

Language-specific OpenType/CFF (OTF)—28 font resources

This deployment configuration is available in four languages—Simplified Chinese, Traditional Chinese, Japanese, and Korean—and sets one language as the default (a default language is required due to the single 'cmap' table), and the 'locl' (*Localized Forms*) GSUB feature is expected to be used to access glyphs that are appropriate for the other three languages.

> *These fonts represent the most compact form that supports all languages and includes the complete set of glyphs, but this comes at the expense of requiring an application to properly support the 'locl' GSUB feature*

in order to display in languages other than the default one. In addition to using such an application, a good example of which is Adobe InDesign, the text—at the character, paragraph, or document level—must also be properly language-tagged.

OpenType/CFF Collection (OTC)—7 font resources

This deployment configuration represents a “best of all possible worlds” in that there are separate font instances for each language, and while each font instance necessarily specifies a default language, the 'locl' GSUB feature can still be used to access the glyphs for the other languages.

These fonts offer the greater flexibility in that there is a single font resource that includes four font instances each with a different one of the four languages serving as its default. Users of these fonts simply choose the appropriate font in an application’s font menu, and the glyphs that are suitable for that language are displayed. However, OpenType/CFF Collections are not yet broadly supported. Windows 10 Anniversary Update (aka Redstone 1 or RS1, released on 2016-08-02), OS X Version 10.8, iOS Version 7.0, and Adobe CS6 applications represent the first environments that support this particular font format. Note that if you install the OTCs, you cannot install any of the corresponding language-specific OTFs because they share the same names.

Super OpenType/CFF Collection (Super OTC)—a single font resource

This deployment configuration packs all seven weights and all four languages into a single font resource that includes a total of 28 font instances and 458,745 total glyphs. Due to OpenType table sharing, there are seven unique 'CFF ', 'GPOS', 'hmtx', and 'vmtx' tables (one per weight), and four unique 'GSUB' and 'cmap' tables (one per language). These represent the largest OpenType tables, so greater sharing leads to a smaller overall footprint. This saves over 10MB compared to the seven separate OTCs. While each font instance specifies a default language, the 'locl' GSUB feature can still be used to access the glyphs for the other languages.

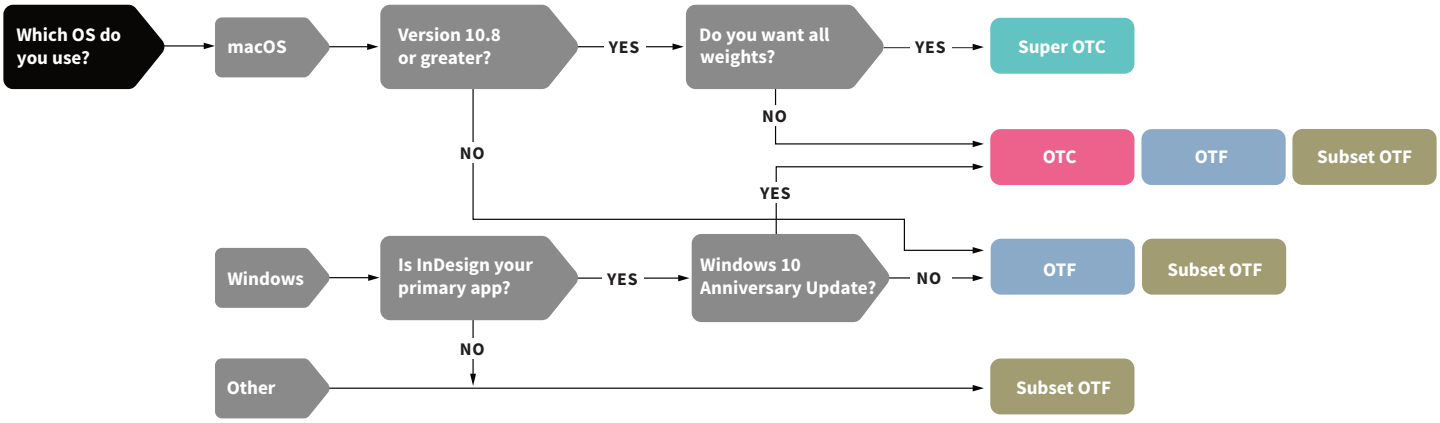
This font offers the greatest flexibility in that there is a single font resource that includes all font instances, one for each of the seven weights and four languages. Users of this font simply choose the appropriate font in an application’s font menu, and the glyphs that are suitable for that language are displayed. The Super OTC is subject to the same caveats and limitations as the standard OTCs. Please be aware that while Windows 10 Anniversary Update is the first version of Windows OS to support OTCs, Windows 10 Creators Update (aka Redstone 2 or RS2) is necessary to support the Super OTC, due to its large number of font instances.

Region-specific Subset OpenType/CFF (Subset OTF)—28 font resources

This deployment configuration includes four different subsets, and each subset includes only the glyphs that are necessary for Simplified Chinese, Traditional Chinese, Japanese, or Korean.

These fonts are considered the most broadly usable because the 'locl' GSUB feature is not required to access the region-specific glyphs. Instead, only the glyphs that are necessary for each region are included. This deployment configuration is recommended for users who need only the glyphs for a specific region, and also desire the smallest possible footprint. These fonts are expected to behave the same as conventional Simplified Chinese, Traditional Chinese, Japanese, or Korean fonts.

The flowchart below may be helpful in deciding which deployment configurations are usable in your current or preferred working environment:



If the flowchart suggests that you are able to make use of more than one deployment configuration, please re-examine the descriptions above to determine which one would better satisfy your usage needs.

Our Recommendation

If the flowchart indicates that you are able to make use of more than one deployment configuration, we recommend one or more of the region-specific subset OTFs mainly due to the fact that they are usable in a broader range of environments. If you choose to download and install the language-specific OTFs, OTCs, or Super OTC, please be mindful of their requirements for accessing region-specific glyphs and various OS limitations.

Font Resources

The table below lists all 64 font resources that are included in this release, organized by format and language, and providing their file and PostScript names:

Format	Language	File Name	PostScript Name/Names
OTF	Simplified Chinese	*SourceHanSerifSC-ExtraLight.otf*	SourceHanSerifSC-ExtraLight
		SourceHanSerifSC-Light.otf	SourceHanSerifSC-Light
		SourceHanSerifSC-Regular.otf	SourceHanSerifSC-Regular
		SourceHanSerifSC-Medium.otf	SourceHanSerifSC-Medium
		SourceHanSerifSC-SemiBold.otf	SourceHanSerifSC-SemiBold
		SourceHanSerifSC-Bold.otf	SourceHanSerifSC-Bold
		SourceHanSerifSC-Heavy.otf	SourceHanSerifSC-Heavy
	Traditional Chinese	*SourceHanSerifTC-ExtraLight.otf*	SourceHanSerifTC-ExtraLight
		SourceHanSerifTC-Light.otf	SourceHanSerifTC-Light
		SourceHanSerifTC-Regular.otf	SourceHanSerifTC-Regular
		SourceHanSerifTC-Medium.otf	SourceHanSerifTC-Medium
		SourceHanSerifTC-SemiBold.otf	SourceHanSerifTC-SemiBold
		SourceHanSerifTC-Bold.otf	SourceHanSerifTC-Bold
		SourceHanSerifTC-Heavy.otf	SourceHanSerifTC-Heavy
	Japanese	*SourceHanSerif-ExtraLight.otf*	SourceHanSerif-ExtraLight
		SourceHanSerif-Light.otf	SourceHanSerif-Light
		SourceHanSerif-Regular.otf	SourceHanSerif-Regular
		SourceHanSerif-Medium.otf	SourceHanSerif-Medium
		SourceHanSerif-SemiBold.otf	SourceHanSerif-SemiBold
		SourceHanSerif-Bold.otf	SourceHanSerif-Bold
		SourceHanSerif-Heavy.otf	SourceHanSerif-Heavy

Format	Language	File Name	PostScript Name/Names
OTF (cont'd)	Korean	*SourceHanSerifK-ExtraLight.otf*	SourceHanSerifK-ExtraLight
		SourceHanSerifK-Light.otf	SourceHanSerifK-Light
		SourceHanSerifK-Regular.otf	SourceHanSerifK-Regular
		SourceHanSerifK-Medium.otf	SourceHanSerifK-Medium
		SourceHanSerifK-SemiBold.otf	SourceHanSerifK-SemiBold
		SourceHanSerifK-Bold.otf	SourceHanSerifK-Bold
		SourceHanSerifK-Heavy.otf	SourceHanSerifK-Heavy
OTC	All	*SourceHanSerif-ExtraLight.ttc*	SourceHanSerif-ExtraLight, SourceHanSerifK-ExtraLight, SourceHanSerifSC-ExtraLight, SourceHanSerifTC-ExtraLight
		SourceHanSerif-Light.ttc	SourceHanSerif-Light, SourceHanSerifK-Light, SourceHanSerifSC-Light, SourceHanSerifTC-Light
		SourceHanSerif-Regular.ttc	SourceHanSerif-Regular, SourceHanSerifK-Regular, SourceHanSerifSC-Regular, SourceHanSerifTC-Regular
		SourceHanSerif-Medium.ttc	SourceHanSerif-Medium, SourceHanSerifK-Medium, SourceHanSerifSC-Medium, SourceHanSerifTC-Medium
		SourceHanSerif-SemiBold.ttc	SourceHanSerif-SemiBold, SourceHanSerifK-SemiBold, SourceHanSerifSC-SemiBold, SourceHanSerifTC-SemiBold
		SourceHanSerif-Bold.ttc	SourceHanSerif-Bold, SourceHanSerifK-Bold, SourceHanSerifSC-Bold, SourceHanSerifTC-Bold
		SourceHanSerif-Heavy.ttc	SourceHanSerif-Heavy, SourceHanSerifK-Heavy, SourceHanSerifSC-Heavy, SourceHanSerifTC-Heavy
Super OTC	All	*SourceHanSerif.ttc*	SourceHanSerif-ExtraLight, SourceHanSerifK-ExtraLight, SourceHanSerifSC-ExtraLight, SourceHanSerifTC-ExtraLight, SourceHanSerif-Light, SourceHanSerifK-Light, SourceHanSerifSC-Light, SourceHanSerifTC-Light, SourceHanSerif-Regular, SourceHanSerifK-Regular, SourceHanSerifSC-Regular, SourceHanSerifTC-Regular, SourceHanSerif-Medium, SourceHanSerifK-Medium, SourceHanSerifSC-Medium, SourceHanSerifTC-Medium, SourceHanSerif-SemiBold, SourceHanSerifK-SemiBold, SourceHanSerifSC-SemiBold, SourceHanSerifTC-SemiBold, SourceHanSerif-Bold, SourceHanSerifK-Bold, SourceHanSerifSC-Bold, SourceHanSerifTC-Bold, SourceHanSerif-Heavy, SourceHanSerifK-Heavy, SourceHanSerifSC-Heavy, SourceHanSerifTC-Heavy
Subset OTF	CN	*SourceHanSerifCN-ExtraLight.otf*	SourceHanSerifCN-ExtraLight
		SourceHanSerifCN-Light.otf	SourceHanSerifCN-Light
		SourceHanSerifCN-Regular.otf	SourceHanSerifCN-Regular
		SourceHanSerifCN-Medium.otf	SourceHanSerifCN-Medium
		SourceHanSerifCN-SemiBold.otf	SourceHanSerifCN-SemiBold
		SourceHanSerifCN-Bold.otf	SourceHanSerifCN-Bold
		SourceHanSerifCN-Heavy.otf	SourceHanSerifCN-Heavy
	TW	*SourceHanSerifTW-ExtraLight.otf*	SourceHanSerifTW-ExtraLight
		SourceHanSerifTW-Light.otf	SourceHanSerifTW-Light
		SourceHanSerifTW-Regular.otf	SourceHanSerifTW-Regular
		SourceHanSerifTW-Medium.otf	SourceHanSerifTW-Medium
		SourceHanSerifTW-SemiBold.otf	SourceHanSerifTW-SemiBold
		SourceHanSerifTW-Bold.otf	SourceHanSerifTW-Bold
		SourceHanSerifTW-Heavy.otf	SourceHanSerifTW-Heavy
	JP	*SourceHanSerifJP-ExtraLight.otf*	SourceHanSerifJP-ExtraLight
		SourceHanSerifJP-Light.otf	SourceHanSerifJP-Light
		SourceHanSerifJP-Regular.otf	SourceHanSerifJP-Regular
		SourceHanSerifJP-Medium.otf	SourceHanSerifJP-Medium
		SourceHanSerifJP-SemiBold.otf	SourceHanSerifJP-SemiBold
		SourceHanSerifJP-Bold.otf	SourceHanSerifJP-Bold
		SourceHanSerifJP-Heavy.otf	SourceHanSerifJP-Heavy

Format	Language	File Name	PostScript Name/Names
Subset OTF (cont'd)	KR	*SourceHanSerifKR-ExtraLight.otf*	SourceHanSerifKR-ExtraLight
		SourceHanSerifKR-Light.otf	SourceHanSerifKR-Light
		SourceHanSerifKR-Regular.otf	SourceHanSerifKR-Regular
		SourceHanSerifKR-Medium.otf	SourceHanSerifKR-Medium
		SourceHanSerifKR-SemiBold.otf	SourceHanSerifKR-SemiBold
		SourceHanSerifKR-Bold.otf	SourceHanSerifKR-Bold
		SourceHanSerifKR-Heavy.otf	SourceHanSerifKR-Heavy

Glyph Set Particulars

Glyph Set & Region-specific Subsets

The number of glyphs in each font resource—except for the region-specific subset OTFs—is 65,535 (CIDs 0 through 65534), which is at the architectural limit for CID-keyed fonts (65,535 glyphs).

The table below indicates the number of glyphs that are included in the region-specific subset OTFs, whose figures include a common set of 2,539 glyphs that correspond to various characters, symbols, and punctuation. Also provided are the names of the subset definition files that are included in this open source project.

Language	Glyphs	Subset Definition File	Supported Standards
Simplified Chinese	30,938	*AI0-SourceHanSerif.CN*	All GB 18030 hanzi, all 8,105 hanzi of *Tōngyòng Guīfàn Hànzìbiǎo* (通用规范汉字表), 199 of which are outside of GB 18030
Traditional Chinese	16,328	*AI0-SourceHanSerif.TW*	All Big Five hanzi, the seven ETen hanzi
Japanese	17,825	*AI0-SourceHanSerif.JP*	All Adobe-Japan1-6 kanji (a superset of those in JIS X 0208, JIS X 0213 & JIS X 0212)
Korean	24,702	*AI0-SourceHanSerif.KR*	All contemporary (11,172) and 500 high-frequency archaic hangul syllables, conjoining hangul jamo (with full archaic hangul support), all KS X 1001 and KS X 1002 hanja (7,476), 466 additional hanja

Of course, the font resources that include the full set of 65,535 glyphs support all of the standards that are listed in the above table, and employ some method of accessing the glyphs for different languages when they occupy the same Unicode code point and require a different shape.

The ordering file, *AI0-SourceHanSerif*, lists all 65,535 CIDs in the first column, and shows the FDArray and row font structure in the second and third columns, respectively, along with the Unicode-based working glyph names in the fourth column. All 65,535 working glyph names are unique, and all—with the exception of the ones for CID+0 (the *.notdef* glyph) and CIDs 64785 through 65534—use a "uni" (BMP) or "u" (outside BMP) prefix followed by uppercase hexadecimal digits. Glyphs that are represented by (or can be considered) sequences are made up of concatenations of the appropriate Unicode-based glyph names. Identifiers for regions and other purposes are also used.

Weights

The table below shows sample glyphs in each of the seven weights, ranging from ExtraLight to Heavy. The ExtraLight and Heavy weights represent the master designs, and the five intermediate weights are the result of multiple master interpolation (the interpolation ratios are provided):

ExtraLight—0	Light—95	Regular—210	Medium—360	SemiBold—510	Bold—730	Heavy—1000
汉漢 漢한	汉漢 漢한	汉漢 漢한	汉漢 漢한	汉漢 漢한	汉漢 漢한	汉漢 漢한

Glyph Complement PDFs

Included in this open source project are seven Unicode-based glyph complement PDFs, one for each weight, that provide a visual synopsis of the UTF-32 'cmap' tables for each of the four supported languages: Japanese, Korean, Simplified Chinese, and Traditional Chinese. For each code point that maps to a glyph, there are three types of annotations, described as follows according to their position relative to the code-point box:

Upper-Left—Glyph width: **F** = Full-width, **H** = Half-width, **M** = Monospaced (hangul letters and syllables), **P** = Proportional, **Q** = Quarter-width, **T** = Tall (U+3031, U+3032, and the vertical forms of U+2E3A and U+2E3B), **W** = Wide (U+2E3A and U+2E3B), **Z** = Zero (non-spacing)

Upper-Right—Language/Region: **C** = Simplified Chinese (China), **H** = Traditional Chinese (Hong Kong SAR), **J** = Japanese, **K** = Korean, **T** = Traditional Chinese (Taiwan)

Bottom—The CID of the glyph

Each glyph complement PDF contains four bookmarked 360-page sections, one for each language, meaning 1,440 pages in total. Glyphs that are tall (T), wide (W), or non-spacing (Z) may exceed or appear outside the code-point box, which includes those for U+20DD, U+2E3A, U+2E3B, U+302A through U+302D, U+3031, U+3032, U+3099, and U+309A.

Also included in this open source project are seven glyph complement PDFs, one for each weight, that show the 500 pre-composed high-frequency archaic hangul syllables, ordered by their two- or three-character combining sequences.

Unencoded Glyphs

Not shown in the Unicode-based glyph complement PDFs are glyphs that are unencoded.

Ignoring code points that share different Simplified Chinese, Traditional Chinese, Japanese, and Korean glyphs, there are 4,118 unencoded glyphs in each 65,535-glyph font resource. The region-specific subset OTFs include considerably fewer unencoded glyphs.

Approximately one-fourth of the unencoded glyphs are Japanese ideographs (kanji), all of which represent kanji included in Adobe-Japan1-6. Some of these have been explicitly identified as JIS90 (JIS X 0208-1990) glyphs according to their source glyph names (CIDs 61064 through 61229; 166 glyphs) and are reflected in the 'jp90' GSUB feature that is specific to the Japanese fonts and font instances, and the remainder have been identified according to their registered IVSes (CIDs 61230 through 62248; 1,019 glyphs) in the *Adobe-Japan1 IVD (Ideographic Variation Database)* Collection, and are reflected in the Format 14 'cmap' subtable of the same fonts and font instances.

The bulk of the remaining unencoded glyphs are the 500 high-frequency archaic hangul syllables, the glyphs for combing jamo, vertical forms, and a small number of other variants.

Latin, Greek & Cyrillic Glyphs

Included in all font resources is a rich set of Latin glyphs that support not only ASCII and ISO/IEC 8859-1 (aka ISO Latin 1), but also the characters that are necessary for broadly-used CJK transliteration and transcription

systems, along with those that are necessary for Latin-based Vietnamese. A basic set of glyphs for Greek and Cyrillic, with proportional metrics, is also included.

Source Han Serif Versus Source Serif Pro

The Latin, Latin-like, Greek, and Cyrillic glyphs in Source Han Serif are derived from—but not identical to—Source Serif Pro. The Latin and Latin-like glyphs in a typical CJK font represent a minority, and when it comes to harmonizing glyphs of different scripts, it is better to modify the minority to harmonize with the majority, and not vice versa. In addition, half-width glyphs in typical CJK fonts are also expected to be precisely half-width, and those included in Source Han Serif are derived from Source Serif Pro.

There are two primary differences between the glyphs that are common in Source Han Serif and Source Serif Pro:

- The interpolation ratios for the weights are different. Source Han Serif is available in seven weights: ExtraLight, Light, Regular, Medium, SemiBold, Bold, and Heavy. Source Serif Pro is available in six: ExtraLight, Light, Regular, Semibold, Bold, and Black. While some of the weight names are the same, one should not expect that the interpolation ratios are the same. They will be relatively close, but not precisely the same.
- The glyphs in Source Han Serif that are derived from Source Serif Pro have been adapted for use in Source Han Serif, which mainly involves scaling. In the case of the ExtraLight and Heavy weights, the Source Serif Pro glyphs were scaled to 107.5% and 113.3%, respectively. Thus, the Source Han Serif glyphs appear to be slightly larger than those in Source Serif Pro, particularly in the heavier weights.

The half-width Latin glyphs in Source Han Serif, which are exposed via the 'hwid' GSUB feature, are completely different from the glyphs in Source Code Pro in that they were derived from Source Serif Pro.

The table below compares Source Han Serif with Source Serif Pro—with Source Code Pro added for good measure—for three weights, ExtraLight, Regular, and Heavy/Black:

Weight	Source Han Serif & Source Han Serif 'hwid'	Source Serif Pro & Source Code Pro
ExtraLight	Unicode Version 9.0	↔ Unicode Version 9.0
	Unicode Version 9.0	↔ Unicode Version 9.0
Regular	Unicode Version 9.0	↔ Unicode Version 9.0
	Unicode Version 9.0	↔ Unicode Version 9.0
Heavy/ Black	**Unicode Version 9.0**	↔ **Unicode Version 9.0**
	Unicode Version 9.0	↔ **Unicode Version 9.0**

Vertical Glyphs

The usual and expected set of vertical glyphs is included, some of which are region- or language-specific. In addition, all glyphs for kana, meaning not only those for small kana, include a vertical glyph variant. A small number of vertical glyphs happen to be encoded for compatibility reasons, most of which can be found in the U+FE*xx* range, but they are still accessible via the 'vert' GSUB feature as vertical variants of the horizontal forms that are encoded elsewhere.

The pre-rotated non–full-width glyphs that are typically accessible via the effectively-deprecated 'vrt2' GSUB feature have been intentionally excluded from the glyph set.

CIDFont Resource & CFF Particulars

CIDFont Resource Structure

The font resources that include 65,535 glyphs began their life as an *Adobe-Identity-0* ROS CIDFont resource that includes 19 FDArray elements, each of which specifies its own hinting parameters. The table below shows the names of each of the 19 FDArray elements, its index, the CIDs and CID ranges that are included, and the total number of glyphs:

FDArray Name	Index	CIDs & CID Ranges	Glyphs
Alphabetic	0	59976–60001, 60008–60033	52
AlphabeticDigits	1	951–970, 59959–59968, 60166–60176	41
Bopomofo	2	1649–1691, 1801–1827, 64605	71
Dingbats	3	102, 111, 116, 149, 181, 245–249, 713, 716–717, 724–725, 727–730, 735, 737, 741, 745–752, 755, 757–759, 761–762, 787–823, 825–950, 971–1070, 1231–1278, 1280–1285, 1287–1321, 1323–1347, 1384–1459, 1546–1549, 1553, 1644, 1785–1800, 1880–2439, 59876–59958, 59969–59975, 60002–60007, 60034–60038, 60153–60159, 60177–60207, 60209–60266, 60269–60422, 62280–62293, 62419–62422, 64404–64419, 64506–64507, 64511, 64622–64722	1,560
DingbatsDigits	4	763–786	24
Generic	5	0, 1071–1230, 1279, 1286, 64785–65534	913
HDingbats	6	60160–60165	6
HHangul	7	60102–60152	51
HKana	8	60039–60101	63
HWidth	9	62305–62320, 62331–62401	87
HWidthCJK	10	62402–62418	17
HWidthDigits	11	62321–62330	10
Hangul	12	365–620, 1692–1784, 48489–59761, 62423–64403	13,603
Ideographs	13	1350–1383, 1828–1863, 2440–48488, 59762–59870, 60423–61039, 61064–62248, 64747–64784	48,068
Kana	14	1460–1545, 1550–1552, 1554–1643, 1645–1648, 1864–1879, 61040–61063	223
Proportional	15	1–101, 103–110, 112–115, 117–148, 150–180, 182–244, 250–364, 621–712, 714–715, 718–723, 726, 731–734, 736, 738–740, 742–744, 753–754, 756, 760, 824, 1322, 1348–1349, 59871–59875, 60208, 60267–60268, 62304	483
ProportionalCJK	16	62249–62279	31
ProportionalDigits	17	62294–62303	10
VKana	18	64420–64505, 64508–64510, 64512–64604, 64606–64621, 64723–64746	222

CFF Subroutinization

All 'CFF ' tables have been subroutinized. The size savings range anywhere from 5 to 7.5MB for the 65,535-glyph OTFs and OTCs. The ExtraLight weight exhibits the greatest size savings.

A new version of the AFDKO *tx* tool, with a completely revamped CFF subroutinizer that is invoked using the existing "+S" command-line option, was used to subroutinize the CIDFont resources into subroutinized 'CFF ' tables. This new subroutinizer is approximately three orders of magnitude faster than the one that is built into the AFDKO *makeotf* tool, which means that instead of taking up to a full day to subroutinize a 65,535-glyph CIDFont resource into a subroutinized 'CFF ' table, depending on the processor speed and available memory, it now takes approximately one minute, and with comparable results, in terms of the number of subroutines and the size savings.

Until this new version of the *tx* tool is made available in a new release of AFDKO, the *makeotf* command-line option and argument, *-maxs 25000*, should be specified to keep the number of subroutines under the "32K − 3" (32,765) threshold. The actual implementation limit is "64K − 3" subroutines, though some environments may treat "32K − 3" as an implementation-specific limit.

It is important to understand that limiting the number of subroutines does not, in any practical or meaningful sense, cripple the 'CFF ' tables in terms of their potential to become smaller. This is because the makeotf *subroutinizer identifies—very early on during its processing—the most size-effective subroutines, and at some point during its processing the size of the subroutine data may cancel out—or nearly cancel out—the size-savings that is achieved through subroutinization. Exhaustive testing prior to release revealed that the 25,000-subroutine limit that should be imposed is already at or near the point of diminishing returns.*

Unicode Particulars

Unicode Mappings

The Format 12 (UTF-32) 'cmap' subtable of each language-specific OTF and OTC specifies 43,031 meaningful mappings, and the region-specific subset OTFs obviously include less. Note that some glyphs map from multiple code points, such as the entire U+2F*xx* range, along with a large chunk of the CJK Compatibility Ideographs. When the four UTF-32 CMap resources are combined, a total of 61,417 glyphs are covered, which leaves 4,118 glyphs as being not directly unencoded. 21 of the mappings in the URO (*Unified Repertoire & Ordering*), U+9FD6 through U+9FEA, are expected to be included in Unicode Version 10.0 (mid-2017), but have been deemed stable enough to use.

In addition to the ideographs for which there are obviously a large number of language-specific glyphs, the following code points also exhibit language-specific variation:

Unicode	Simplified Chinese	Traditional Chinese	Japanese	Korean
U+2018	‘	‘	‘	‘
U+2019	’	’	’	’
U+201C	“	“	“	“
U+201D	”	”	”	”
U+2264	≤	≤	≤	≤
U+2265	≥	≥	≥	≥
U+226E	≮	≮	≮	≮
U+226F	≯	≯	≯	≯
U+3001	、	、	、	、
U+3002	。	。	。	。
U+FF01	！	！	！	！
U+FF0C	，	，	，	，

Unicode	Simplified Chinese	Traditional Chinese	Japanese	Korean
U+FF0E	．	．	．	．
U+FF1A	：	：	：	：
U+FF1B	；	；	；	；
U+FF1F	？	？	？	？

Included as part of this open source project are the raw (and human-readable) UTF-32 mapping files—named *utf32-cn.map*, *utf32-tw.map*, *utf32-jp.map*, and *utf32-kr.map*—that were used as the raw sources to compile the UTF-32 CMap resources—named *UniSourceHanSerifCN-UTF32-H*, *UniSourceHanSerifTW-UTF32-H*, *UniSourceHanSerifJP-UTF32-H*, and *UniSourceHanSerifKR-UTF32-H*—that the AFDKO *makeotf* tool uses to generate the Format 12 (UTF-32) 'cmap' subtables.

Matching UTF-16 CMap resources, which should not be used to build the OpenType fonts, are included for good measure.

Unicode Coverage

In addition to complete URO, Extension A, and contemporary hangul syllable coverage, the 65,535-glyph font resources completely cover the following 256-character Unicode blocks: U+00*xx*, U+11*xx*, U+2F*xx* through U+33*xx* (except for U+332C), U+D7*xx*, U+FF*xx*, and U+1F2*xx*.

Unicode Variation Sequences

All registered *Adobe-Japan1* IVSes—except for <6CE8 E0102> (Adobe-Japan1-6 CID+12869), which is excluded because it is outside the scope of the Source Han Serif glyph set—are specified in the Format 14 'cmap' subtable of each Japanese font and font instance, along with 89 of the 1,002 Standardized Variants that were introduced in Unicode Version 6.3. This means that 14,682 *Adobe-Japan1* IVSes and 89 Standardized Variants are included. 13,310 of these UVSes are default, meaning that the glyph is directly encoded, and the remaining 1,460 are non-default (unencoded or encoded in a CJK Compatibility Ideograph block, at least for Japanese fonts and font instances). The provided *SourceHanSerif_JP_sequences.txt* file specifies the UVSes.

Each Korean font and font instance includes 270 UVSes that correspond to 270 of the 1,002 Standardized Variants that were introduced in Unicode Version 6.3. All of these UVSes are default (directly encoded). The provided *SourceHanSerif_KR_sequences.txt* file specifies the UVSes.

Each Simplified Chinese font and font instance includes nine UVSes that correspond to nine of the 1,002 Standardized Variants that were introduced in Unicode Version 6.3. Six of these UVSes are default (directly encoded), and the remaining three are non-default (encoded in the CJK Compatibility Ideographs block). The provided *SourceHanSerif_CN_sequences.txt* file specifies the UVSes.

Each Traditional Chinese font and font instance includes two UVSes that correspond to two of the 1,002 Standardized Variants that were introduced in Unicode Version 6.3. Both of these UVSes are default (directly encoded). The provided *SourceHanSerif_TW_sequences.txt* file specifies the UVSes.

Glyph Sharing Statistics

One of the defining characteristics of Pan-CJK typeface designs is the significant sharing of glyphs across languages or regions. However, to honor regional conventions, some code points, in particular the ideographs, may require more than one glyph per code point. The URO exhibits the greatest variation, in terms of including a large number of code points that require multiple language-specific glyphs. In general, as one progress-

es through the CJK Unified Ideograph extensions, from Extensions A through Extension F, the number of code points that require multiple language-specific glyphs diminishes.

The table below lists several code point categories, and shows how many glyphs are used to represent the 43,031 code points:

			CJK Unified Ideograph Extensions						
		URO	A	B	C	D	E	F	Other
Glyphs	1	7474	6098	385	45	33	108	3	14696
	2	8757	484	4					161
	3	4471							43
	4	269							

Of particular interest should be the 269 highlighted URO code points that have four unique glyphs, one per language. The table below shows these 269 ideographs in each of the four supported languages:

Simplified Chinese	偉偠偰傑僭公凞分割劘博呀啄喓喝喫圍塌塚夔契妥姬姿娜娵媛媺媾嫌 嬴宵尊導岈巡幃幰廋延微徵忍惘慧慨憊懲房扇搧摩撐攇敷曜松榻次殺 毒氓汇沿滾潔潛濯瀛灰煢爟爟牙掌琢璵甄甿瘦癒癰盆瞎瞬研磨禍程穴 穿突窖竄竇節篠簉籐粉糖糙納級紛絳綢縈編緯縛縫繁繩繭蠯餅罔羸翁 翌習翠翦翩翫翼耀聖肓肩脈贏舛舜舞船艘芒苣茫蓮蔑蕣薄藤虐虜虞虻 蝨術衛袞裒裯褊褐褅訝訟認誕誤誹請諏諞諭諮謁譖豁貧資贏輞轄迅迎 近迓返迪迫迭述迷追退送逃逆透逐途通逝逞速造逢連逮週進逸遂遇遊 運遍過遑道達違遘遠遣適遭遮遵遷選遺遼避邃還邙鄰釁鉛鏖閧降雇雕 雪雰靖靡顧颼食飢飯飼飽飾養餓館驎驟鬍鬣鬮魍魔鴉麗麟麻齉鼬龜
Traditional Chinese	偉偠偰傑僭公凞分割劘博呀啄喓喝喫圍塌塚夔契妥姬姿娜娵媛媺媾嫌 嬴宵尊導岈巡幃幰廋延微徵忍惘慧慨憊懲房扇搧摩撐攇敷曜松榻次殺 毒氓汇沿滾潔潛濯瀛灰煢爟爟牙掌琢璵甄甿瘦癒癰盆瞎瞬研磨禍程穴 穿突窖竄竇節篠簉籐粉糖糙納級紛絳綢縈編緯縛縫繁繩繭蠯餅罔羸翁 翌習翠翦翩翫翼耀聖肓肩脈贏舛舜舞船艘芒苣茫蓮蔑蕣薄藤虐虜虞虻 蝨術衛袞裒裯褊褐褅訝訟認誕誤誹請諏諞諭諮謁譖豁貧資贏輞轄迅迎 近迓返迪迫迭述迷追退送逃逆透逐途通逝逞速造逢連逮週進逸遂遇遊 運遍過遑道達違遘遠遣適遭遮遵遷選遺遼避邃還邙鄰釁鉛鏖閧降雇雕 雪雰靖靡顧颼食飢飯飼飽飾養餓館驎驟鬍鬣鬮魍魔鴉麗麟麻齉鼬龜
Japanese	偉偠偰傑僭公凞分割劘博呀啄喓喝喫圍塌塚夔契妥姬姿娜娵媛媺媾嫌 嬴宵尊導岈巡幃幰廋延微徵忍惘慧慨憊懲房扇搧摩撐攇敷曜松榻次殺 毒氓汇沿滾潔潛濯瀛灰煢爟爟牙掌琢璵甄甿瘦癒癰盆瞎瞬研磨禍程穴 穿突窖竄竇節篠簉籐粉糖糙納級紛絳綢縈編緯縛縫繁繩繭蠯餅罔羸翁 翌習翠翦翩翫翼耀聖肓肩脈贏舛舜舞船艘芒苣茫蓮蔑蕣薄藤虐虜虞虻 蝨術衛袞裒裯褊褐褅訝訟認誕誤誹請諏諞諭諮謁譖豁貧資贏輞轄迅迎 近迓返迪迫迭述迷追退送逃逆透逐途通逝逞速造逢連逮週進逸遂遇遊 運遍過遑道達違遘遠遣適遭遮遵遷選遺遼避邃還邙鄰釁鉛鏖閧降雇雕 雪雰靖靡顧颼食飢飯飼飽飾養餓館驎驟鬍鬣鬮魍魔鴉麗麟麻齉鼬龜

Korean	偉偠偰傑僭公凞分割劘博呀啄喓喝喫圍塌塚夔契妥姬姿娜婀媛媺媾嫌 嬴宵尊導岈巡幃幰廋延微徵忍惘慧慨憊懲房扇搦摩撐攇敷曜松榻次殺 毒氓汦沿滾潔潛濯瀛灰煢爟爝牙掌琢璵甄甽瘦癒癰盆瞎瞬砑磨禍程穴 穿突窖竄竇節篠簉籐粉糖糙納級紛絳綢綮編緯縛縫繁繩繭蠯皏罔贏翁 翌習翠翦翩翫翼耀聖肓肩脈贏舛舜舞船艘芒苣茫蓮蔑薨薄藤虐虜虞虻 蝨術衛袞裒裯褊褐褓訝訟認誕誤誹請諏諞諭諮謁譖豁貧資贏輞轄迅迎 近迓返迪迫迭述迷追退送逃逆透逐途通逝逞速造逢連逮週進逸遂遇遊 運遍過遑道達違遘遠遣適遭遮遵遷選遺遼避邃還邙鄰釁鉛鏖閼降雇雕 雪雰靖靡顧颼食飢飯飼飽飾養餓館驎驟鬍鬣鬮魍魔鴉麗麟麻齉鼬龜

UAX #50 Compliance

Source Han Serif is one of the first font implementations that is compliant with UAX #50 (*Unicode Vertical Text Layout*). Only the substitutions in the 'vert' GSUB feature are expected to be used, and the 'vrt2' GSUB feature, which is a subset of the 'vert' GSUB feature, is included only because some environments, such as Windows and some Microsoft applications, require it to be present. In particular, pre-rotated non–full-width glyphs have been excluded from the 'vrt2' GSUB feature, and substitutions for arrows and arrow-like characters have also been excluded from both GSUB features.

Language Particulars

Simplified Chinese: GB 18030 & China's Tōngyòng Guīfàn Hànzìbiǎo

In addition to supporting GB 18030, which primarily amounts to Simplified Chinese glyphs for all URO and Extension A code points plus six Extension B code points, China's latest list of 8,105 hanzi (通用规范汉字表 *Tōngyòng Guīfàn Hànzìbiǎo*), which includes 196 additional Extension B through E code points, along with three that were appended to the URO for 199 in total, is also supported. Among these 199 hanzi, 36 map to Extension B, 44 map to Extension C, eight map to Extension D, 108 map to Extension E, and three have been appended to the URO (U+9FCD through U+9FCF).

Traditional Chinese: TW Versus HK Coverage

Beginning with Version 2.000, there will be separate TW (Taiwan) and HK (Hong Kong SAR) fonts and font instances for Traditional Chinese. To the extent that is possible, the TW glyphs adhere to the Taiwan MOE (*Ministry of Education*) glyph standard.

A small number of HK glyphs are included in this release, mainly for the purpose of filling gaps, such as at the end of the URO.

Due to the scope of Traditional Chinese coverage, which is limited to Big Five (equivalent to CNS 11643 Planes 1 and 2) and Hong Kong SCS, any CJK Unified Ideograph code point that is outside that scope is not likely to display appropriately for Traditional Chinese use.

Japanese: Adobe-Japan1-6 Correspondence Table & JIS Coverage

The provided *aj16-kanji.txt* mapping file shows how all Adobe-Japan1-6 kanji map to working glyph names as specified in the fourth field of the included *AI0-SourceHanSerif* ordering file. In order to support the *Adobe-Japan1* IVD Collection, glyphs for all Adobe-Japan1-6 kanji—except for <6CE8 E0102> (Adobe-Japan1-6 CID+12869), which is excluded because it is outside the scope of the Source Han Serif glyph set—are included.

Due to the JIS standard coverage of Adobe-Japan1-6 that is inherited by Source Han Serif, all JIS X 0208, JIS X 0213, and JIS X 0212 kanji are therefore supported. JIS2004 (aka JIS X 0213:2004) glyphs are the default for the relevant code points. A small number of characters in the JIS standards, such as those for IPA, along with additional Latin, Greek, and Cyrillic that were not deemed necessary, have been intentionally excluded.

Although Source Han Serif includes the same kanji as Adobe-Japan1-6, including a large number of kanji variants, compatibility shouldn't be expected for documents that were authored using applications that specify glyphs by CID. The only Adobe-Japan1-6 compatibility that should be expected is at the Unicode level, which includes the *Adobe-Japan1* IVSes that are specified in the Format 14 'cmap' subtable.

Korean: Hangul Glyphs & Hanja Coverage

Glyphs for all contemporary Korean hangul symbols, letters (including compatibility versions), and syllables are included, along with the additional glyphs necessary to compose archaic hangul via the 'ljmo', 'vjmo', and 'tjmo' GSUB features. Also included are glyphs for 500 high-frequency archaic hangul syllables in pre-composed form, which are made accessible via the 'ccmp' GSUB feature.

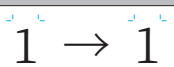
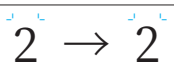
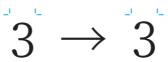
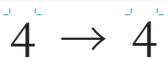
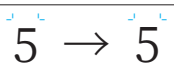
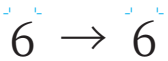
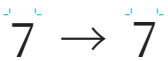
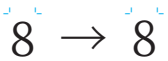
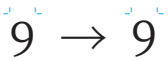
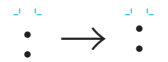
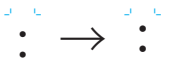
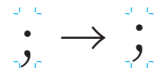
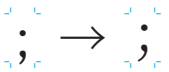
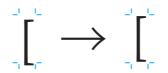
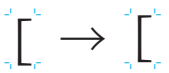
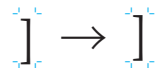
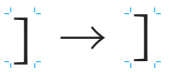
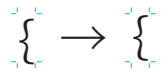
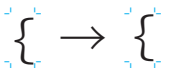
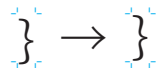
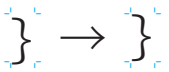
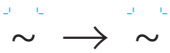
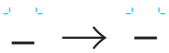
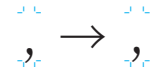
While the horizontal advances of the glyphs for Korean hangul symbols (in the U+32*xx* block) are full-width (1000 units), those for Korean hangul letters and syllables are monospaced at 966 units.

The provided *ks-hanja.txt* mapping file shows how the hanja in the KS X 1001 (4,620) and KS X 1002 (2,856) standards map to working glyph names as specified in the fourth field of the included *AI0-SourceHanSerif* ordering file.

Proportional & Half-Width CJK Punctuation

Included in these fonts are special forms of the proportional and half-width punctuation shown in the table below, which have been tailored for CJK use in that they are aligned to the em-box, not to Latin features, and which are accessible via the 'locl' GSUB feature:

Unicode	Proportional	Half-Width[1]	Chinese	Japanese	Korean
U+0020	→				Yes
U+0021	! → ！	! → ！			Yes
U+0022	" → ＂	" → ＂	Yes	Yes	Yes
U+0027	' → ＇	' → ＇	Yes	Yes	Yes
U+0028	(→ （	(→ （			Yes
U+0029	) → ）	) → ）			Yes
U+002C	, → ，	, → ，			Yes
U+002D[2]	- → －	– → -			Yes
U+002E	. → ．	. → ．			Yes
U+002F	/ → ／	/ → ／			Yes
U+0030[2]	0 → ０		Yes	Yes	Yes

Unicode	Proportional	Half-Width[1]	Chinese	Japanese	Korean
U+0031[2]			Yes	Yes	Yes
U+0032[2]			Yes	Yes	Yes
U+0033[2]			Yes	Yes	Yes
U+0034[2]			Yes	Yes	Yes
U+0035[2]			Yes	Yes	Yes
U+0036[2]			Yes	Yes	Yes
U+0037[2]			Yes	Yes	Yes
U+0038[2]			Yes	Yes	Yes
U+0039[2]			Yes	Yes	Yes
U+003A					Yes
U+003B					Yes
U+003F					Yes
U+005B					Yes
U+005D					Yes
U+007B					Yes
U+007D					Yes
U+007E					Yes
U+00AD					Yes
U+00B7					Yes
U+2011					Yes
U+2013					Yes
U+2014			Yes	Yes	Yes
U+2018			Yes[3]	Yes	Yes
U+2019			Yes[3]	Yes	Yes
U+201A			Yes	Yes	Yes
U+201C			Yes[3]	Yes	Yes

Unicode	Proportional	Half-Width[1]	Chinese	Japanese	Korean
U+201D	” → ”		Yes[3]	Yes	Yes
U+201E	„ → „		Yes	Yes	Yes
U+2026[2]	... → ...		Yes	Yes	Yes
U+203C	!! → !!		Yes	Yes	Yes
U+2047	?? → ??		Yes	Yes	Yes
U+2048	?! → ?!		Yes	Yes	Yes
U+2049	!? → !?		Yes	Yes	Yes
U+2E3A	—— → ——		Yes	Yes	Yes
U+2E3B	——— → ———		Yes	Yes	Yes

1 The half-width glyphs are not encoded by default, and are accessible via the 'hwid' GSUB feature in all fonts and font instances.
2 These characters are unique in that the CJK forms are encoded by default, and the Western forms are accessible when the text is language-tagged for English.
3 The default glyph for this code point is full-width, not proportional, so the 'pwid' GSUB feature must first be invoked to access the proportional glyph that is tailored for CJK use.

OpenType Particulars

Menu Names

The table below shows the English and localized Family names for each font and font instance:

Configuration	Family Name—English	Family Name—Localized
Simplified Chinese OTF & OTC	*Source Han Serif SC*	思源宋体
Traditional Chinese OTF & OTC	*Source Han Serif TC*	思源宋體
Japanese OTF & OTC	*Source Han Serif*	源ノ明朝
Korean OTF & OTC	*Source Han Serif K*	본명조
Simplified Chinese OTF (subset)	*Source Han Serif CN*	思源宋体 CN
Traditional Chinese OTF (subset)	*Source Han Serif TW*	思源宋體 TW
Japanese OTF (subset)	*Source Han Serif JP*	源ノ明朝 JP
Korean OTF (subset)	*Source Han Serif KR*	본명조 KR

For the region-specific subset OTFs, the English and localized menu names also include region identifiers. Their PostScript names, as shown in the table in the section entitled “Font Resources” section on page 4, use the same region identifiers. With the exception of Japanese, the language-specific OTFs and OTCs include a one- or two-letter language identifier only for their English menu names.

The Regular weight in all fonts and font instances is style-linked to the Bold weight. For applications that support style-linking, the Regular weight becomes the Bold weight if the “Bold” style is selected.

Because the OTCs and the corresponding language-specific OTFs specify identical PostScript and Family names, they cannot be installed in the same environment.

OpenType Tables

All font resources, with the exception of the OTCs, include the following 16 OpenType tables: 'BASE', 'CFF ', 'DSIG', 'GPOS', 'GSUB', 'OS/2', 'VORG', 'cmap', 'head', 'hhea', 'hmtx', 'maxp', 'name', 'post', 'vhea', and 'vmtx'. The OTCs do not include a 'DSIG' table.

The four font instances in each of the seven OTCs share the following ten OpenType tables: 'BASE', 'CFF ', 'GPOS', 'VORG', 'hhea', 'hmtx', 'maxp', 'post', 'vhea', and 'vmtx'. The following five OpenType tables are not completely shared by the four font instances in each OTC: 'GSUB', 'OS/2', 'cmap', 'head', and 'name'. The Super OTC shares OpenType tables more efficiently.

OpenType Table Overrides

Several values in particular OpenType tables have been overridden from their otherwise default values. The subsections below detail some of the more important table-specific overrides that have been applied.

'OS/2' Table Overrides

The *OS/2.sTypoLineGap* value has been set to 0 (zero) units, and is also reflected in the *hhea.LineGap* and *vhea.lineGap* values. The *OS/2.usWinAscent* and *OS/2.usWinDescent* values have been calculated by removing excessively tall and other vertical-only glyphs—for U+2E3A, U+2E3B, U+302A through U+302D, U+3031, and U+3032—from the equation, and have been harmonized across all seven weights. These same harmonized settings are also reflected in the *hhea.Ascender* and *hhea.Descender* values. This is for the benefit of applications that use these values for determining default leading. These and other 'OS/2' table settings are intended to provide consistent cross-platform line spacing (aka vertical metrics).

'name' Table Overrides

Unlike mainstream OpenType/CFF CJK fonts, a *name.ID=20* string is not specified because there are no legacy (non-Unicode) encodings that meaningfully correspond to these fonts. In addition, the 'name' table does not include any Macintosh (*PlatformID=1*) strings, which was accomplished by invoking the AFDKO *makeotf* tool's *-omitMacNames* command-line option. This means that the 'name' table includes only Unicode strings.

'vmtx' Table Overrides

In addition to specifying alternate vertical origins for full-width Latin and Latin-like glyphs that rest on the Latin baseline, proper vertical origins and vertical advances are also specified for the glyphs that correspond to U+3031 and U+3032, and to the vertical forms of U+2E3A, U+2E3B, U+302E, and U+302F.

OpenType GSUB Features

All fonts and font instances include the OpenType GSUB features (see the OpenType Feature Registry for additional information) as detailed in the table below:

	OTF & OTC				Subset OTF			
GSUB Feature	SC	TC	J	K	CN	TW	JP	KR
aalt	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
calt	Yes	Yes	Yes	Yes				Yes
ccmp[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
dlig	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
fwid[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
hist	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
hwid[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
jp78[2]			Yes				Yes	

	OTF & OTC				Subset OTF			
GSUB Feature	SC	TC	J	K	CN	TW	JP	KR
jp83[2]			Yes				Yes	
jp90[2]			Yes				Yes	
liga	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ljmo	Yes	Yes	Yes	Yes				Yes
locl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
nlck[2]			Yes				Yes	
pwid[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
tjmo	Yes	Yes	Yes	Yes				Yes
vert[2]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
vjmo	Yes	Yes	Yes	Yes				Yes
vrt2[3]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

1 Two not-yet-encoded ideographs, both of which are read *biáng*, 𰻞/𰻝/𰻞 (traditional form for Simplified Chinese, Traditional Chinese, and Japanese) and 𬜬 (simplified form for Simplified Chinese), are included in the glyph set and are made accessible via this GSUB feature by entering the following sequences: 讠穴月长言馬么長 刂心 and 讠穴月长言马么长 刂心. To repurpose these sequences, either copy the desired character or its visible sequence.
2 This GSUB feature is inherited by the 'aalt' GSUB feature.
3 This GSUB feature is a subset—not superset, as is usually the case—of the 'vert' GSUB feature.

All fonts and font instances that include hangul letters or syllables include a Korean-specific glyph for the *space* character (U+0020), whose width is set to 310 units for all weights. The width of the proportional glyph for the *space* character ranges from 259 units (in ExtraLight) to 247 units (in Heavy) in all fonts and font instances. A contextual substitution in the 'calt' GSUB feature substitutes the proportional *space* glyph with the Korean-specific version only when it is surrounded by a hangul syllable (contemporary or archaic), regardless of whether it is pre-composed or combining.

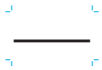
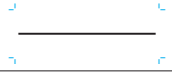
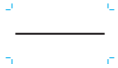
The 'ccmp' GSUB Feature

The 'ccmp' GSUB feature is used to form the appropriate glyphs that correspond to the sequences needed to support a small number of kana, many of which are included in JIS X 0213 but are intentionally unencoded, along with the 500 high-frequency pre-composed archaic hangul syllables. PDF specimens for the latter can be found in the GlyphComplements folder of the release branch of this open source project. A complete listing of the former is provided in the table below:

Unicode Sequence	Glyph	Present in JIS X 0213
<3042 3099>	あ゙	
<3044 3099>	い゙	
<3048 3099>	え゙	
<304A 3099>	お゙	
<304B 309A>	か゚	Yes
<304D 309A>	き゚	Yes
<304F 309A>	く゚	Yes

Unicode Sequence	Glyph	Present in JIS X 0213
<3051 309A>	げ	Yes
<3053 309A>	ご	Yes
<3093 3099>	ん	
<30A2 3099>	ア	
<30A4 3099>	イ	
<30A8 3099>	エ	
<30AA 3099>	オ	
<30AB 309A>	ガ	Yes
<30AD 309A>	ギ	Yes
<30AF 309A>	グ	Yes
<30B1 309A>	ゲ	Yes
<30B3 309A>	ゴ	Yes
<30BB 309A>	ゼ	Yes
<30C4 309A>	ヅ	Yes
<30C8 309A>	ド	Yes
<30F3 3099>	ジ	
<31F7 309A>	ㇷ゚	Yes

This GSUB feature is also used to support the two- and three-character sequences shown in the table below:

Unicode Sequence	Unicode	Western Glyph	CJK Glyph
<2014 2014 2014>	U+2E3B		
<2014 2014>	U+2E3A		
<2015 2015 2015>	U+2E3B		
<2015 2015>	U+2E3A		
<3033 3035>	U+3031		
<3034 3035>	U+3032		

The glyphs that result from the first four sequences can be overridden, in terms of Western versus CJK glyph style, by applying the 'locl' GSUB feature, which entails using an application that supports this OpenType feature and properly language tagging the text. These sequences merely serve as a convenience mechanism for environments that do not support language tagging.

The 'locl' GSUB Feature

The 'locl' GSUB feature plays a critical role in the language-specific OTFs in that it represents the *only* mechanism within the font resource for accessing the glyphs for the non-default languages. If the 'locl' GSUB feature is not supported or not properly used, the default glyphs are used. Each non-default language is handled via a separate lookup that is associated with the appropriate language and script, and one of its purposes is to mimic the 'cmap' table of the target language.

The font instances of the OTCs also include the 'locl' GSUB feature, but its presence represents an alternate method for accessing the glyphs for the non-default languages that does not involve selecting a different font instance of the OTC.

Note that in addition to using an application that supports the 'locl' GSUB feature, such as Adobe InDesign or particular modern browsers (examples include Chrome, Firefox, and Safari), the text must also be properly language-tagged at the character, paragraph, or document level.

Also note that all font resources, including the region-specific subset OTFs, include the 'locl' GSUB feature. For the region-specific subset OTFs that obviously do not include glyphs for the ideographs of the non-supported regions, the 'locl' GSUB feature instead operates only on a small number of glyphs for punctuation by tailoring them for CJK use. See the table in the “Proportional & Half-Width CJK Punctuation” section on page 14 for a showing of these special glyphs.

The 'vert' GSUB Feature

The 'vert' GSUB feature includes substitutions that may be different for each region or language, which apply to the following code points:

Unicode	Simplified Chinese	Traditional Chinese	Japanese	Korean
U+2018[1]	‘ → ﹁	‘ → ′	‘	‘
U+2019[1]	’ → ﹂	’ → ′	’	’
U+201C[1]	“ → ﹃	“ → ″	“	“
U+201D[1]	” → ﹄	” → ″	”	”
U+3001	、 → ﹑	、	、 → ˙	、 → ˙
U+3002	。 → ﹒	。	。 → ˚	。 → ˚
U+FF01	！ → !	！	！	！ → !
U+FF0C	， → ﹐	，	， → ˙	， → ˙
U+FF0E	． → ﹒	．	． → ˚	． → ˚
U+FF1A	： → ﹕	：	： → ‥	： → ﹕
U+FF1B	； → ﹔	；	；	； → ﹔

Unicode	Simplified Chinese	Traditional Chinese	Japanese	Korean
U+FF1F	？ → ？	？	？	？ → ？

1 To achieve the same vertical substitution effect as Traditional Chinese for Japanese or Korean, the 'fwid' GSUB feature must first be applied to change the default proportional glyphs to their full-width forms.

OpenType GPOS Features

Seven GPOS features, 'halt', 'kern', 'palt', 'vert', 'vhal', 'vkrn', and 'vpal', are included in all font resources, and their details are listed below (see the OpenType Feature Registry for additional information):

- The 'halt' and 'vhal' GPOS feature are identical across all weights.
- The 'palt' and 'vpal' GPOS features for ExtraLight through Medium are identical, as are those for SemiBold through Heavy. These features cover the glyphs for kana, some full-width punctuation, some full-width symbols, full-width digits, and full-width Latin.
- The 'kern' GPOS feature includes weight-specific kerning pairs for proportional Latin, Greek, and Cyrillic glyphs, along with weight-independent kerning pairs for kana and some punctuation. The 'vkrn' GPOS feature includes only weight-independent kerning pairs for kana and some punctuation.
- The 'vert' GPOS feature is used to adjust the glyphs for U+20DD, U+302A through U+302D, U+3099, U+309A, and those that represent vowels and trailing consonants of combining jamo, which have zero-unit horizontal advances, such that their positions and vertical origins are appropriate for vertical writing.

Noto Serif CJK Differences

Other than by name, the Google-branded version of this typeface design, Noto Serif CJK, differs in the following ways:

- The *name.ID=0* (*Copyright notice*) string does not include a reference to the “Source” name.
- The *name.ID=7* (*Trademark*) string specifies a Google trademark.
- The *name.ID=11* (*URL Vendor*) string specifies a Google URL.
- A *name.ID=12* (*URL Designer*) string was added that specifies an Adobe URL.
- Although localized menu names are not specified, localized 'name' table strings are included, in terms of *name.IDs* 1, 2, 4, 16, and 17, though the actual strings are identical to the English-language ones.
- The *OS/2.usWeightClass* value is set to 200 for ExtraLight (Source Han Serif ExtraLight uses 250) per Noto CJK Issue #86.
- The *OS/2.achVendID* tag is set to *GOOG* (Source Han Serif uses *ADBO*).
- Although glyphs for U+2252 and U+25C8 are included, named *uni2252* (CID+851) and *uni25C8* (CID+1254), the Format 4 and 12 'cmap' subtables do not include mappings for U+2252 and U+25C8, per Noto CJK Issue #24 and Noto CJK Issue #23, respectively.

Changes

Version 1.001

Build Date: May 1, 2017. Built By: Dr. Ken Lunde (小林劍). Release Date: May 8, 2017.

General

- Mappings for U+3164 and U+2D544 (Extension F) were added to all CMap resources, and the *Adobe-Japan1* IVS <U+2D544,U+E0100> was added to the Japanese IVS definition file, *SourceHanSerif_JP_sequences.txt*. See Issue #37.
- The glyphs for U+2EC1 虎, U+2EEA 黽, U+2F2C 中, and U+4EBD 仐 now map to *uni864EuE0101-JP*, *uni9EFE-CN*, *uni5C6E-CN*, and *uni4EBD-CN*, respectively, in all CMap resources. See Issue #37.
- The glyphs for the 52 half-width jamo—U+FFA0 through U+FFBE, U+FFC2 through U+FFC7, U+FFCA through U+FFCF, U+FFD2 through U+FFD7, and U+FFDA through U+FFDC—now map to the glyphs for compatibility jamo (U+3131 through U+3164).
- The alternate proportional digits and punctuation, along with the alternate half-width punctuation, were added to the scope of the ‘fwid’, ‘hwid’, and ‘pwid’ GSUB features.

Simplified Chinese

- CN glyphs for U+35EB 嚓, U+385C 嚓, U+5015 俜, U+57F5 埵, U+618F 惨, U+63EF 掩, U+6456 擦, U+6660 晠, U+66A9 暩, U+68B1 梱, U+6F08 潦, U+76E4 盘, U+7808 砸, U+78DC 磔, U+7A07 稇, U+7A44 穇, U+7BA0 箠, U+83D9 蓪, U+92EE 鍡, U+9318 錘, U+969B 際, U+9BCE 鰔, and U+9C36 鰶 were added. See Issue #40.
- The glyphs for U+2F22 夂, U+2F58 爻, U+4F8D 侍, U+62FF 拿, U+6301 持, U+6641 晁, U+6C35 氵, U+6DE6 淦, U+6DFC 淼, U+6EB4 溴, and U+81EC 臬 now map to *uni590A-CN*, *uni723B-CN*, *uni4F8D-JP*, *uni62FF-JP*, *uni6301-JP*, *uni6641-JP*, *uni6C35-JP*, *uni6DE6-JP*, *uni6DFC-JP*, *uni6EB4-JP*, and *uni81EC-JP*, respectively. See Issue #37.
- The CN glyphs *uni3E76-CN*, *uni414D-CN*, *uni4A60-CN*, *uni4BD5-CN*, *uni4C53-CN*, *uni4F5B-CN*, *uni4FB9-CN*, *uni596E-CN*, *uni5957-CN*, *uni5A17-CN*, *uni5EAD-CN*, *uni5EF7-CN*, *uni5F73-CN*, *uni602B-CN*, *uni62C2-CN*, *uni633A-CN*, *uni6883-CN*, *uni6C11-CN*, *uni6C1F-CN*, *uni6CB8-CN*, *uni6D8F-CN*, *uni6E88-CN*, *uni70F6-CN*, *uni73FD-CN*, *uni7829-CN*, *uni7D8E-CN*, *uni7ECB-CN*, *uni8121-CN*, *uni8247-CN*, *uni8713-CN*, *uni8A94-CN*, *uni8B04-CN*, *uni92CC-CN*, *uni94E4-CN*, *uni95AE-CN*, *uni9F2E-CN*, *uniFF1B-CN*, *uniFE14-CN*, and *u2CD9F-CN* were tweaked or corrected. See Issue #36 and Issue #39.

Traditional Chinese—TW

- TW glyphs for U+4FB9 侹, U+5EAD 庭, U+5EF7 廷, U+633A 挺, U+6883 梃, U+6D8F 涎, U+6DEB 淫, U+73FD 斑, U+7D8E 綎, U+7F54 罔, U+8713 蜓, U+8DA3 趣, U+92CC 錠, U+95AE 闎, and U+9832 頲 were added. See Issue #40.
- The glyphs for U+2F61 瓦, U+2FCC 黽, U+504F 偏, U+5553 啓, U+555F 啟, U+58F3 売, U+58FE 壾, U+591A 多, U+61DC 懜, U+627F 承, U+6902 椹, U+6903 椾, U+6947 楇, U+7171 煑, U+76EC 盬, U+77A2 瞢, U+77D2 矒, U+8019 耙, U+803B 耻, U+8B04 謄, and U+9BF1 鯱 now map to *uni74E6-JP*, *uni9EFD-JP*, *uni504FuE0101-JP*, *uni5553uE0101-JP*, *uni555F-JP*, *uni58F3-JP*, *uni58FE-JP*, *uni591A-JP*, *uni61DC-JP*, *uni627F-JP*, *uni6902-JP*, *uni6903-JP*, *uni6947-JP*, *uni7171-JP*, *uni76EC-CN*, *uni77A2uE0101-JP*, *uni77D2-JP*, *uni8019-JP*, *uni803B-JP*, *uni8B04-CN*, and *uni9BF1-JP*, respectively. See Issue #37.
- The glyphs *uni511A-TW*, *uni5922-TW*, *uni5A6C-TW*, *uni5FB5-TW*, *uni61F5-TW*, *uni750B-TW*, *uni750D-TW*, *uni7AC5-TW*, *uni7D73-TW*, *uni83E1-TW*, *uni858E-TW*, *uni85A8-TW*, *uni8609-TW*, *uni9138-TW*, *uni91C5-TW*, and *uniFF0C-TW* were tweaked or corrected. See Issue #36 and Issue #39.

Japanese

- The JP glyphs *uni3CDA-JP*, *uni3D93-JP*, *uni507D-JP*, *uni5316uE0101-JP*, *uni595C-JP*, *uni6C2B-JP*, *uni70BA-JP*, *uni7669-JP*, *uni81F7-JP*, *uni8285-JP*, *uni82B1uE0101-JP*, and *uni9B58-JP* were tweaked or corrected. See Issue #36 and Issue #39.
- The glyphs for a small number of kana, to include annotated versions thereof, were tweaked in very minor ways.

Korean

- The glyphs for U+5173 关 and U+5BE7 寧 now map to *uni5173-CN* and *uni5BE7uE0100-JP*, respectively. See Issue #37.
- The glyphs *uniC625*, *uniC73D*, *uni1178*, *uni118C.vjmo01*, *uni1190.vjmo01*, *uni1192.vjmo01*, *uni11ED*, *uni11ED.tjmo01*, *uni11ED.tjmo02*, *uni11ED.tjmo03*, *uni11ED.tjmo04*, *uniD7B5*, *uniD7B5.vjmo01*, *uniD7F5*, *uniD7F5.tjmo01*, *uniD7F5.tjmo02*, *uniD7F5.tjmo03*, *uniD7F5.tjmo04*, *uniD7F6*, *uniD7F6.tjmo01*, *uniD7F6.tjmo02*, *uniD7F6.tjmo03*, *uniD7F6.tjmo04*, *uni1112uni119Euni11D9*, *uni1140uni1175uni11D9*, and *uni114Cuni116Funi11D9* were corrected. See Issue #39.
- The no-op *uni115F* to *uni115F* substitutions were removed from the six “ljmo_0*n*” lookups, references to *uni115F* were removed from the six “ljmo_*xxxxxx*” lookups, and glyph classes are now used for the “ljmo_*xxxxxx*,” “vjmo_*xxxxxx*,” and “tjmo_*xxxxxx*” lookups.

Noto Serif CJK Only

- The *OS/2.usWeightClass* value for ExtraLight was changed from 250 to 200. See Noto CJK Issue #86.

Version 1.000

Build Date: March 21, 2017. Built By: Dr. Ken Lunde (小林劍). Release Date: April 3, 2017.

First public release.

Known Issues

Please report all issues in the GitHub repository so that they can be properly tracked and addressed, and for greater visibility among the user community. The Wiki also conveys some useful information about upcoming releases. Also, be sure to thoroughly check the closed issues prior to submitting a new issue, being sure to exercise the search feature.

Because these fonts exercise several architectural limits, particularly the ones that include 65,535 glyphs, some environments may have difficulties using them properly, sometimes due to implementation limits or poor assumptions. If this is the case, please report such issues so that they can be recorded and tracked. You are also strongly encouraged to contact the developer of such environments to report the same.

General

- None.

Western

- None.

Chinese—Simplified & Traditional

- The counters of many CN and TW glyphs for ideographs are too wide. See Issue #36.

Simplified Chinese

- Map U+732A 猪 to *uni732A-JP* 猪. See Issue #37.
- Add CN glyphs for U+3402, U+3A17, and U+5DC6. See Issue #40.
- Add a CN glyph for U+8D17 by renaming then removing its TW glyph, *uni8D17-TW*. See Issue #40.
- Add a CN glyph for U+2967F, and map U+2EDE to it in the CN and TW CMap resouces. See Issue #37 & Issue #40.
- Adjust the CN glyph *uni5D75-CN* so that the two parts of its 寺 component do not connect. See Issue #36.
- Fix the CN glyphs *uni4676-CN*, *uni471B-CN*, and *uni4785-CN*. See Issue #39.
- Investigate the 'locl' GSUB issue that affects U+9F2C in JP and KR fonts. See Issue #37.

Traditional Chinese

- Consider redesigning the glyphs for bopomofo, the glyph for U+3025 ㄠ so that it better matches the glyphs for bopomofo, and TW glyphs that contain 𠂉 as a component. See Issue #36.

Traditional Chinese—TW

- The intentional lack of Macintosh 'name' table strings exposes an issue in macOS, specifically Version 10.12 and earlier, whereby the Traditional Chinese family name appears in localized form when the UI language is not set to Traditional Chinese, and its multiple weights may be split into two separate family names, one of them being in English. This cosmetic issue occurs only in Apple apps, such as *Font Book* and *TextEdit*, or in apps that depend on OS services for font enumeration. This issue is caused by the Traditional Chinese strings sorting before the English ones, per the OpenType Specification, due to having a lower LanguageID value: 0x404 (1028 decimal) for Traditional Chinese versus 0x409 (1033 decimal) for English. A future version of macOS is expected to address this issue. See Issue #8.
- Map U+3B6D 棚, U+5009 倉, and U+5225 別 to *uni3B6D-JP* 棚, *uni5009-JP* 倉, and *uni5225-JP* 別, respectively. See Issue #37.

Traditional Chinese—HK

- Although Version 1.000 included a small number of Traditional Chinese glyphs for HK use, broader HK coverage is planned for Version 2.000, which will be in the form of Hong Kong SCS-2016 support, along with the deployment of separate HK fonts and font instances.

Japanese

- None.

Korean

- Add KR ideographs for personal names. See Issue #40.

That is all.