

Fonts

without

Borders

<https://goo.gl/XpeQer>

Behdad Esfahbod

behdad@google.com

GUADEC, August 9, 2015, Gothenburg, Sweden

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Borders

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Agenda

- HarfBuzz Indic shaper
- Universal Shaping Engine
- Noto Fonts
- Color fonts!
- TrueType GX / Multiple Masters

Not covered:

- GLyphy
- FontTools

HarfBuzz Indic Shaper

HarfBuzz Indic Shaper

- Maintain three diverging Indic shapers
- Font vs shaper bug / feature / responsibility
- Existing implementations too *magical*

commit 7c21c1a52489fab823fd95e7f3082280e973a13e

Author: Behdad Esfahbod <behdad@gnome.org>

Date: Wed Aug 6 08:40:12 2008 +0000

Bug 441654 - prefix fails when more than one base characters (as

2008-08-06 Behdad Esfahbod <behdad@gnome.org>

Bug 441654 - prefix fails when more than one base characters (as
conjuncts) present after a half form the next prefix renders
incorrectly

Patch from Rahul Bhalerao

* modules/indic/mprefixups.c (indic_mprefixups_apply):

Do what I was told to do.

svn path=/trunk/; revision=2682

```
diff --git a/modules/indic/mprefixups.c b/modules/indic/mprefixups.c
index 4acb6d0..a599e6d 100644
--- a/modules/indic/mprefixups.c
+++ b/modules/indic/mprefixups.c
@@ -81,7 +81,7 @@ void indic_mpfixups_apply(MPreFixups *mprefixups,
PangoOTBuffer *buffer)
    pango_ot_buffer_get_glyphs (buffer, &glyphs, &n_glyphs);

    for (i = 0; i < n_glyphs; i++) {
-        if (baseGlyph < 0 && glyphs[i].cluster == baseIndex)
+        if ((baseIndex >= glyphs[i].cluster) && (baseIndex-glyphs[i].cluster) % 2
== 0) /* bug 441654 */
            baseGlyph = i;
        if (glyphs[i].cluster == mpreIndex) {
            if (mpreGlyph < 0)
```

HarfBuzz Indic Shaper



- Maintain three diverging Indic shapers
- Font vs shaper bug / feature / responsibility
- Existing implementations too *magical*

⇒ Develop a new shaper “to rule ‘em all”!

HarfBuzz Indic Shaper: Syllable Analysis

Consonant syllable:

$$\{C+[N]+<H+[<ZWNJ|ZWJ>]|<ZWNJ|ZWJ>+H>\} + C+[N]+[A] + [<H+[<ZWNJ|ZWJ>] | \{M\}+[N]+[H]>]+[SM]+[(VD)]$$

Vowel-based syllable:

$$[Ra+H]+V+[N]+[<[<ZWJ|ZWNJ>]+H+C|ZWJ+C>]+[\{M\}+[N]+[H]]+[SM]+[(VD)]$$

Stand Alone cluster (at the start of the word only):

$$\#[Ra+H]+NBSP+[N]+[<[<ZWJ|ZWNJ>]+H+C>]+[\{M\}+[N]+[H]]+[SM]+[(VD)]$$

HarfBuzz Indic Shaper: Syllable Analysis

```
c = (C | Ra);           # is_consonant
n = ((ZWNJ?.RS)? (N.N?)?); # is_consonant_modifier
z = ZWJ|ZWNJ;           # is_joiner
h = H | Coeng;           # is_halant_or_coeng
reph = (Ra H | Repha);   # possible reph

cn = c.ZWJ?.n?;
forced_rakar = ZWJ H ZWJ Ra;
symbol = Symbol.N?;
matra_group = z{0,3}.M.N?.(H | forced_rakar)?;
syllable_tail = (SM.SM?.ZWNJ?)? A{0,3}? VD{0,2};
place_holder = PLACEHOLDER | DOTTEDCIRCLE;
halant_group = (z?.h.(ZWJ.N?)?);
final_halant_group = halant_group | h.ZWNJ;
medial_group = CM?.CM2?;
halant_or_matra_group = (final_halant_group | (h.ZWJ)? matra_group{0,4}) (Coeng (cn|V))?;

consonant_syllable = Repha? (cn.halant_group){0,4} cn medial_group halant_or_matra_group syllable_tail;
vowel_syllable = reph? V.n? (ZWJ | (halant_group.cn){0,4} medial_group halant_or_matra_group syllable_tail);
standalone_cluster = (Repha? PLACEHOLDER | reph? DOTTEDCIRCLE).n? (halant_group.cn){0,4} medial_group halant_or_matra_group syllable_tail;
symbol_cluster = symbol syllable_tail;
broken_cluster = reph? n? (halant_group.cn){0,4} medial_group halant_or_matra_group syllable_tail;
other = any;
```

<https://github.com/behdad/harfbuzz/blob/master/src/hb-ot-shape-complex-indic-machine.rl>

HarfBuzz Indic Shaper: Character Types

C	consonant
V	independent vowel
N	nukta
H	halant/virama
ZWNJ	zero width non-joiner
ZWJ	zero width joiner
M	matra (up to one of each type: pre-, above-, below- or post- base)
SM	syllable modifier signs
VD	vedic
A	anudatta (U+0952)
NBSP	NO-BREAK SPACE

HarfBuzz Indic Shaper: Character Types

INDIC_SYLLABIC_CATEGORY_AVAGRAHA	= OT_Symbol,
INDIC_SYLLABIC_CATEGORY_BINDU	= OT_SM,
INDIC_SYLLABIC_CATEGORY_CANTILLATION_MARK	= OT_A,
INDIC_SYLLABIC_CATEGORY_CONSONANT	= OT_C,
INDIC_SYLLABIC_CATEGORY_CONSONANT_FINAL	= OT_CM,
...	
INDIC_SYLLABIC_CATEGORY_JOINER	= OT_ZWJ,
INDIC_SYLLABIC_CATEGORY_MODIFYING_LETTER	= OT_X,
INDIC_SYLLABIC_CATEGORY_NON_JOINER	= OT_ZWNJ,
INDIC_SYLLABIC_CATEGORY_NUKTA	= OT_N,
INDIC_SYLLABIC_CATEGORY_REGISTER_SHIFTER	= OT_RS,
INDIC_SYLLABIC_CATEGORY_TONE_LETTER	= OT_X,
INDIC_SYLLABIC_CATEGORY_TONE_MARK	= OT_N,
INDIC_SYLLABIC_CATEGORY_VIRAMA	= OT_H,
INDIC_SYLLABIC_CATEGORY_VISARGA	= OT_SM,
INDIC_SYLLABIC_CATEGORY_VOWEL	= OT_V,
INDIC_SYLLABIC_CATEGORY_VOWEL_DEPENDENT	= OT_M,
INDIC_SYLLABIC_CATEGORY_VOWEL_INDEPENDENT	= OT_V

<https://github.com/behdad/harfbuzz/blob/master/src/hb-ot-shape-complex-indic-private.hh>

HarfBuzz Indic Shaper: Shape It

1. Find base consonant
2. Decompose and reorder Matras
3. Reorder marks to canonical order
4. Final reordering

HarfBuzz Indic Shaper: Shape It

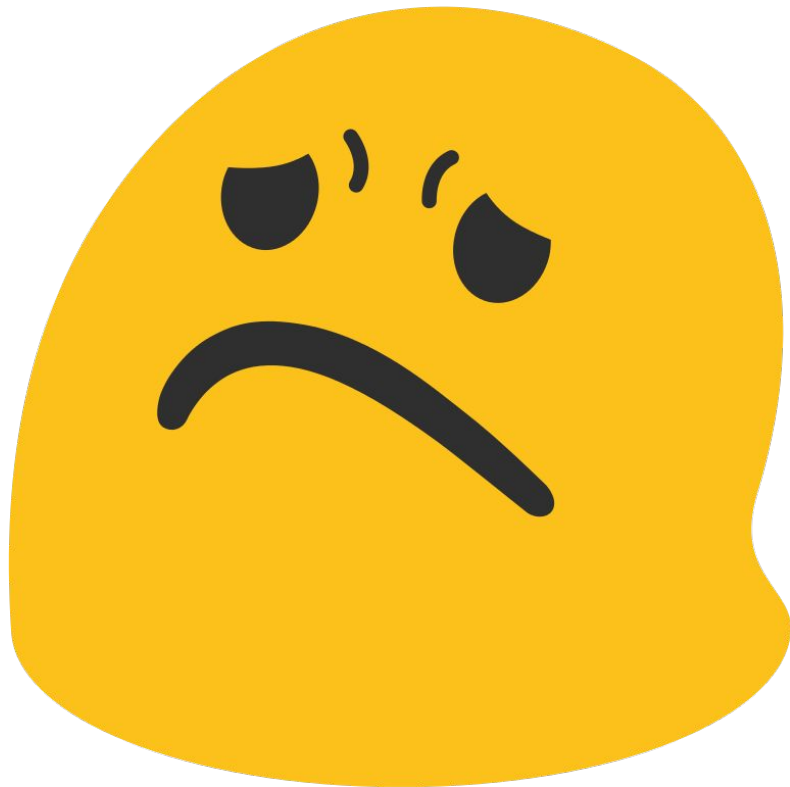
`/* 1. Find base consonant:`

`/* 2. Decompose and reorder Matras:`

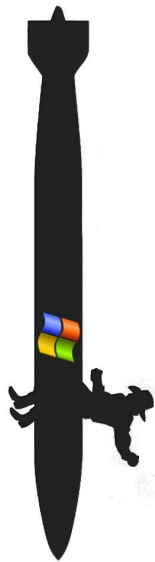
`/* 3. Reorder marks to canonical order:`

`/* 4. Final reordering:`

HarfBuzz Indic Shaper: Test It!



HarfBuzz Indic Shaper: Test It!



DR. UNISCRIBE

(OR HOW I LEARNED TO STOP WORRYING AND LOVE WINDOWS)

HarfBuzz Indic Shaper: Test It!

hb-view

hb-shape

HarfBuzz Indic Shaper: Test It!

\$ **hb-view** arabtype.ttf سَتا

سَتا

\$ **hb-shape** arabtype.ttf سَتا

[uniFE8E=3+343|uniFE98=2+376|uni064E=0@501,-260+0|
uni0640.curvehalf=0@0,34+152|uniFEB3=0@0,34+840]

\$ **hb-shape** arabtype.ttf سَتا --shaper=**uniscribe**

[uniFE8E=3+343|uniFE98=2+376|uni064E=0@501,-260+0|
uni0640.curvehalf=0@0,34+152|uniFEB3=0@0,34+840]

HarfBuzz Indic Shaper: Test It!

\$ **hb-view** arabtype.ttf سَتا

سَتا

\$ **hb-shape** arabtype.ttf سَتا

[uniFE8E=3+343|uniFE98=2+376|uni064E=0@501,-260+0|
uni0640.curvehalf=0@0,34+152|uniFEB3=0@0,34+840]

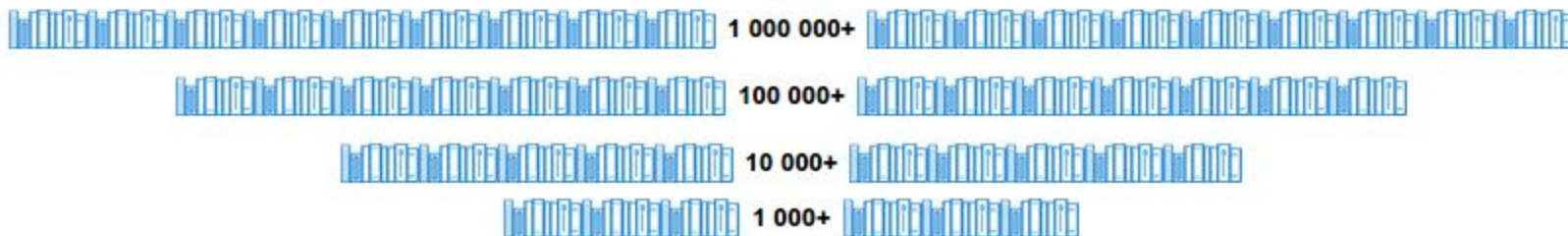
\$ **hb-shape** arabtype.ttf سَتا --shaper=coretext

[uniFE8E=3+343|uniFE98=2+376|uni064E=0@???,???+0|
uni0640.curvehalf=0@0,34+152|uniFEB3=0@0,34+840]

HarfBuzz Indic Shaper: Test It!

**“If it ain’t tested,
it’s broken”**

HarfBuzz Indic Shaper: Test It!



HarfBuzz Indic Shaper: Test It!



HarfBuzz Indic Shaper: Test It!

```
152249: (अ<U+200D>डे)
152249: <U+0905,U+200D,U+0945,U+0921,U+094B,U+092C,U+0947>
-152249: [uni0905+1602|space+0|uni0945@3,-25+0|uni0921+1122|uni094B+534|uni092C+1228|uni0947@-13,0+0]
+152249: [uni0905+1602|space+0|uni0945+0|uni0921+1122|uni094B+534|uni092C+1228|uni0947@-13,0+0]
165729: (अन्त<U+200D>रदहन)
165729: <U+0905,U+0928,U+094D,U+0924,U+200D,U+0930,U+094D,U+0926,U+0939,U+0928>
-165729: [uni0905+1602|glyph220+1068|uni0924+1362|space+0|uni0926+1176|glyph110@-75,0+0|uni0939+1122|uni0928+1388]
+165729: [uni0905+1602|glyph220+1068|uni0924+1362|space+0|uni0930+960|uni094D@149,-34+0|uni0926+1176|uni0939+1122]
185915: (इस्<U+200D>लसि)
185915: <U+0907,U+0938,U+200D,U+0932,U+093F,U+090F>
-185915: [uni0907+1122|uni0938+1496|space+0|glyph871+640|uni0932+1496|uni090F+1228]
+185915: [uni0907+1122|glyph871+640|uni0938+1496|space+0|uni0932+1496|uni090F+1228]
214968: (आ<U+200D>रत)
214968: <U+0906,U+0928,U+200D,U+0930,U+094D,U+0924>
-214968: [uni0906+2148|uni0928+1388|space+0|uni0924+1362|glyph110@32,0+0]
+214968: [uni0906+2148|uni0928+1388|space+0|uni0930+960|uni094D@149,-34+0|uni0924+1362]
216249: (र<U+200D>षिँ)
216249: <U+0930,U+093E,U+091C,U+200D,U+0937,U+093F,U+0901>
-216249: [uni0930+960|uni093E+534|uni091C+1602|space+0|glyph874+640|uni0937+1228|uni0901@17,-25+0]
+216249: [uni0930+960|uni093E+534|uni093F+640|uni091C+1602|space+0|uni0937+1228|uni0901@17,-25+0]
229480: (अ<U+200D>पल)
229480: <U+0905,U+200D,U+0945,U+092A,U+0932>
-229480: [uni0905+1602|space+0|uni0945@3,-25+0|uni092A+1228|uni0932+1496]
:
```

HarfBuzz Indic Shaper: Fix It!

May 2012; power of coffee, Indian food, and two people on one laptop...

DEVANAGARI: 35% → 0.08%: of 693628 tests, 560 failed

HarfBuzz Indic Shaper: Fix It!

July 2012

BENGALI: 353908 out of 354285 tests passed. 377 failed (0.106412%)

DEVANAGARI: 693572 out of 693628 tests passed. 56 failed (0.00807349%)

GUJARATI: 366485 out of 366506 tests passed. 21 failed (0.00572978%)

GURMUKHI: 60750 out of 60809 tests passed. 59 failed (0.0970251%)

KANNADA: 950730 out of 951913 tests passed. 1183 failed (0.124276%)

KHMER: 298613 out of 299124 tests passed. 511 failed (0.170832%)

MALAYALAM: 1046881 out of 1048416 tests passed. 1535 failed (0.146411%)

ORIYA: 42320 out of 42329 tests passed. 9 failed (0.021262%)

SINHALA: 271333 out of 271847 tests passed. 514 failed (0.189077%)

TAMIL: 1091837 out of 1091837 tests passed. 0 failed (0%)

TELUGU: 970524 out of 970573 tests passed. 49 failed (0.00504856%)

HarfBuzz Indic Shaper: Fix It!

Today

BENGALI: 353724 out of 354188 tests passed. 464 failed (0.131004%)

DEVANAGARI: 707307 out of 707394 tests passed. 87 failed (0.0122987%)

GUJARATI: 366349 out of 366457 tests passed. 108 failed (0.0294714%)

GURMUKHI: 60732 out of 60747 tests passed. 15 failed (0.0246926%)

KANNADA: 951190 out of 951913 tests passed. 723 failed (0.0759523%)

KHMER: 299070 out of 299124 tests passed. 54 failed (0.0180527%)

MALAYALAM: 1048140 out of 1048334 tests passed. 194 failed (0.0185056%)

ORIYA: 42320 out of 42329 tests passed. 9 failed (0.021262%)

SINHALA: 271662 out of 271847 tests passed. 185 failed (0.068053%)

TAMIL: 1091753 out of 1091754 tests passed. 1 failed (9.15957e-05%)

TELUGU: 970555 out of 970573 tests passed. 18 failed (0.00185457%)

HarfBuzz Indic-like Shapers:

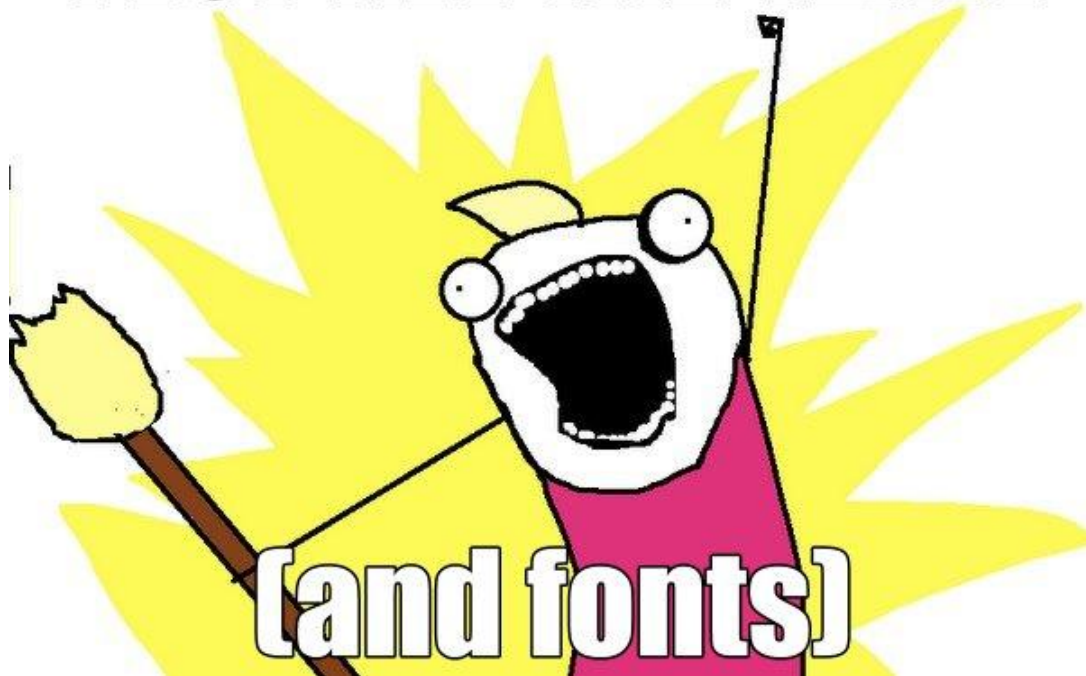
Myanmar

South-East Asian (SEA)

Javanese

HarfBuzz Shapers:

TEST ALL THE TEXTz



Universal Shaping Engine

Shaping in the *post-tofu* era

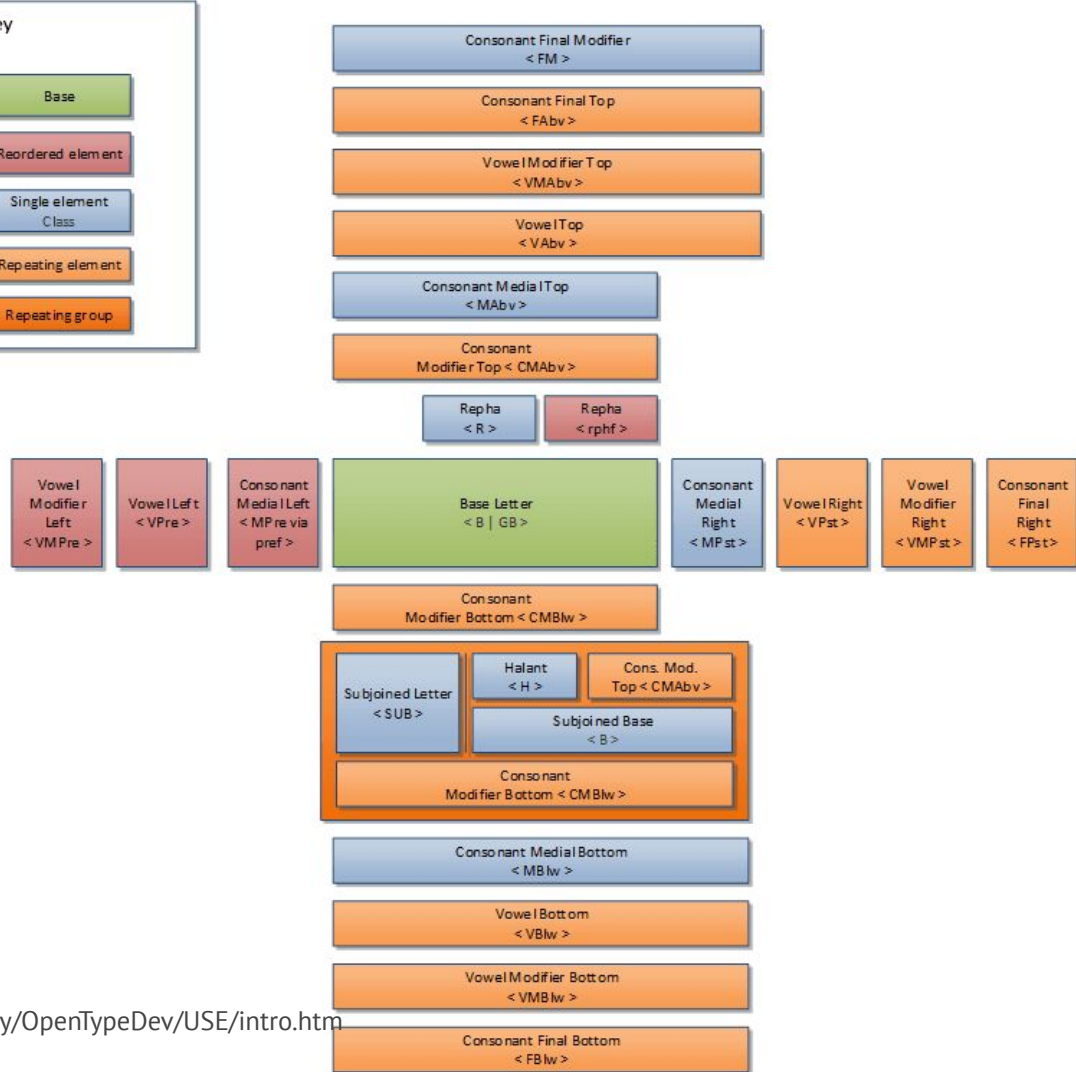
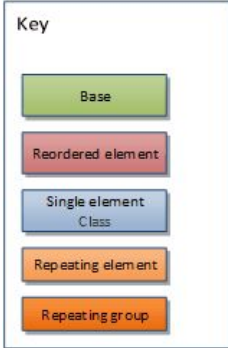
ཀློང་གི་རྒྱ་མཚོ་དེ་ལས་བཤུ་བའི་ཕྱི་རྒྱུ་ཡིན།

Universal Shaping Engine

Shaping in the *post-tofu* era



ॐ नमो भगवते वासुदेवाय



USE: Syllable Analysis

Consonant syllable:

$[R] < B \mid GB > [VS] (CMAbv)^* (CMBlw)^* (< H B \mid SUB > [VS] (CMAbv)^* (CMBlw)^*)^*$
 $[MPre] [MAbv] [MBlw] [MPst]$
 $(VPre)^* (VAbv)^* (VBlw)^* (VPst)^*$
 $(VMPre)^* (VMAbv)^* (VMBlw)^* (VMPst)^*$
 $(FAbv)^* (FBlw)^* (FPst)^* [FM]$

Vowel-based syllable:

$[R] IV [VS] (CMAbv)^* (CMBlw)^* (< H B \mid SUB > [VS] (CMAbv)^* (CMBlw)^*)^*$
 $[MPre] [MAbv] [MBlw] [MPst]$
 $(VMPre)^* (VMAbv)^* (VMBlw)^* (VMPst)^*$
 $(FAbv)^* (FBlw)^* (FPst)^* [FM]$

Universal Shaping Engine: HarfBuzz

commit df6cb84449a473d540821e41fb5007b59644780f

Merge: 2ed6be6 786ba45

Author: Behdad Esfahbod <behdad@behdad.org>

Date: Sun Jul 26 19:40:55 2015 +0200

Merge branch 'use'

HarfBuzz 1.0.0

commit 260442346a5756c3538ee8fcbf157d1cddcf6f36

Author: Behdad Esfahbod <behdad@behdad.org>

Date: Sun Jul 26 23:39:10 2015 +0200

1.0.0



Noto fonts

Noto fonts: goals



“all” of Unicode
homogenous
open source

Noto fonts: 0 to 90%

1–7 weights, 90+ scripts, 300+ font files, 700+ languages, 600K+ unique glyphs

- sans/serif
- naskh/kufi/nastaliq
- Eastern/Western/Estrangela
- color/b&w emoji

[illegible]

Noto fonts: 0 to 90%

Arabic/Persian/Urdu

Hindi/Marathi

Burmese/Mon/Sgaw Karen

vertical forms

ideographic variation sequences

邊邊邊

邊邊邊

邊邊邊

邊邊邊

邊邊邊

Noto fonts: 90 to 95%

Hindi ५८९ झ ढ़

Nepali पृद८ भ ढ्ग

Vedic कौकः

Noto fonts: 90 to 95% Noto Nastaliq Urdu

اس سے میرا مہِ خورشید جمال اچھا ہے
جی میں کہتے ہیں کہ مفت آئے تو مال اچھا ہے
ساغرِ جم سے مرا جامِ سفال اچھا ہے
وہ گدا جس کو نہ ہو خوئے سوال اچھا ہے
وہ سمجھتے ہیں کہ بیمار کا حال اچھا ہے
اک برہمن نے کہا ہے کہ یہ سال اچھا ہے
جس طرح کا کہ کسی میں ہو کمال اچھا ہے
کام اچھا ہے وہ، جس کا کہ مال اچھا ہے
شاہ کے باغ میں یہ تازہ نہال اچھا ہے
دل کے خوش رکھنے کو غالب یہ خیال اچھا ہے

حسنِ مہِ گرچہ بہ ہنگامِ کمال اچھا ہے
بوسہ دیتے نہیں اور دل پہ ہے ہر لحظہ نگاہ
اور بازار سے لے آئے اگر ٹوٹ گیا
بے طلب دیں تو مزہ اس میں سوا ملتا ہے
ان کے دیکھے سے جو آجاتی ہے منہ پر رونق
دیکھیے پاتے ہیں عشاقِ بتوں سے کیا فیض
ہم سخنِ تیشے نے فہاد کو شیریں سے کیا
قطرہ دریا میں جو مل جائے تو دریا ہو جائے
خضرِ سلطان کو رکھے خالقِ اکبر سر سبز
ہم کو معلوم ہے جنت کی حقیقت لیکن



The Death of the Urdu Script

Can Microsoft and Twitter save the dying Urdu nastaliq script from the hegemony of the Western alphabet and an overbearing Arab cousin?



The Death of the Urdu Script

Can Microsoft and Twitter save the dying Urdu nastaliq script from the hegemony of the Western alphabet and an overbearing Arab cousin?

Look!
I'm on
Medium;
I'm
Right!

An open letter to Tim Cook, and Jonathan Ive

iOS 8, Urdu Lovers, and Nastaleeq Typeface

Dear Mr. Tim Cook & Sir Jonathan Ive,

Thank you for keeping up with the amazing bits from Apple.

Purpose of this email is to point you toward an issue that we the Urdu speakers, lovers around the world are having at the moment with iOS, Mac OS, and Urdu default typeface.

See the following image left-side image tells the story of the current situation with the iOS 8 and the right-side image tells the story of what we are looking forward for, after that image some bit of background in bit detail:

Thank You Tim Cook

They heard the Urdu lovers' request regarding Nastaleeq Typeface for Urdu Script on iOS Devices

On October 13, 2014 at 12:28pm I got a call from the office of Apple Inc. CEO Tim Cook. It was about a letter that I just wrote and made it available on Medium, which you can read it [here](#).

They appreciate the Urdu writers and lovers concerned, which was mentioned in the letter. Also they told me it is under their consideration, and could be answered in the upcoming updates (but no promise of which updates of iOS and when).

If you get a chance read my initial reaction to that call [here](#).

However, this post is about my feelings, and **Big Thank You** to Tim Cook for listening our plea, the Urdu speaking people around the world who are actively engage since the inception of my app [Urdu Writer](#).

<https://medium.com/@mmudassir/an-open-letter-to-tim-cook-and-jonathan-ive-be38cf88d8ee>

"I can get another if I break it": Announcing Noto Nastaliq Urdu

Posted: Monday, November 10, 2014

g+1 645



Today, we are excited to release an early version of Noto Nastaliq Urdu.

Nastaliq's rich typographic tradition presents particular challenges to computerized typography. We've been working over a year to solve technical and design issues for an Urdu Nastaliq (aka Nastaleeq) font. This early version is by no means complete and perfect. We expect to work closely with the community to incorporate comments and suggestions.

This preview font can be downloaded from the [Noto homepage](#) or the [Noto repository](#), and is also [available as a webfont](#) on Google Fonts Early Access.

[This](#) is a sample web page to showcase Noto Nastaliq Urdu as a webfont. Go ahead open it. If your browser renders it correctly, you will see something like this:

اور بازار سے لے آئے اگر ٹوٹ گیا

ساغرِ جہم سے میرا جامِ سِفال اچھا ہے

Noto fonts: 90 to 95% Noto Nastaliq Urdu

اور بازار سے لے آئے اگر ٹوٹ گیا
ساغرِ جِحم سے مرا جامِ سِفال اچھا ہے

“I can get another if I break it,
so a clay cup trumps a grail.”

Noto fonts: 90 to 95% Noto Nastaliq Urdu

- IE
- HarfBuzz
- Firefox
- hb-coretext
- Chrome Mac
- Cairo PDF
- pyftsubset

اور بازار سے لے آئے اگر ٹوٹ گیا
ساغرِ جِحم سے مرا جامِ سِفال اچھا ہے

“I can get another if I break it,
so a clay cup trumps a grail.”

Noto fonts: 90 to 95% Noto Nastaliq Urdu

- IE
- HarfBuzz
- Firefox
- hb-coretext
- Chrome Mac
- Cairo PDF
- pyftsubset
- Uniscribe
- CoreText
- Safari

اور بازار سے لے آئے اگر ٹوٹ گیا
ساغرِ جہم سے مرا جامِ سِفال اچھا ہے

“I can get another if I break it,
so a clay cup trumps a grail.”

Noto fonts: 90 to 95% Noto Nastaliq Urdu

- IE
- HarfBuzz
- Firefox
- hb-coretext
- Chrome Mac
- Cairo PDF
- pyftsubset
- Uniscribe
- CoreText
- Safari
- Chrome PDF
- Flash
- InDesign

اور بازار سے لے آئے اگر ٹوٹ گیا
ساغرِ جہم سے مرا جامِ سِفال اچھا ہے

“I can get another if I break it,
so a clay cup trumps a grail.”

From: XXXXXX XXXXXX <XXXX@apple.com>

Date: 11:59pm, Thu, Jul 16 2015

Hi Behdad,

Blah blah blah blah blah blah WWDC public Betas, we are shipping the Noto Nastaliq Draft font in OS X.

Blah blah blah blah blah blah blah blah blah blah blah blah blah blah.

blah blah blah blah blah blah blah blah blah blah blah blah blah?

Best wishes

XXXXXX

Color fonts!

Color fonts: Four implementations

- Apple's PNG images sbix
- Google's PNG images CBDT/CBLC
- Microsoft's layered glyphs COLR/CPAL
- Mozilla and Adobe's SVG SVG

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sbix

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Color fonts: cairo / pixman / Render

Needs more work

Color fonts: cairo / pixman / Render

xdg-app

TrueType GX / Multiple Masters

Roboto Thin

Roboto Light

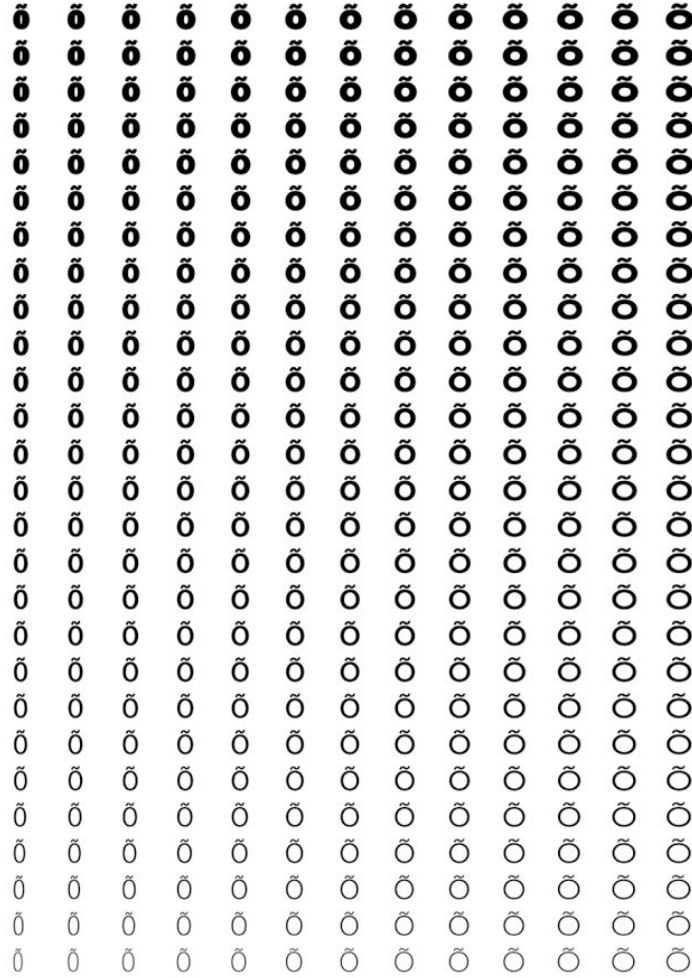
Roboto Regular

Roboto Medium

Roboto Bold

Roboto Black

OpenType GX



Everyone Likes Fonts, right?

Q?