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# Implementation of reverse chain mechanism in Pango for rendering Nastaliq script

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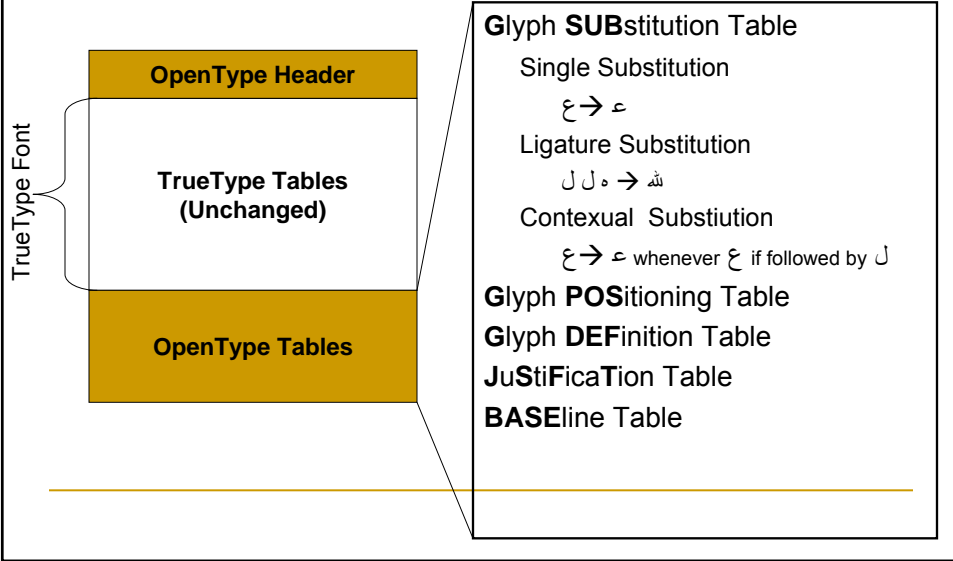
Aamir Wali

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## Presentation Outline

- Introduction
  - OpenType Fonts: Analysis
    - Major Players
  - Enabling OpenType In Linux
  - Expanding OpenType Support in Pango
    - Reverse Chain Contextual Substitution
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# OpenType



# OpenType Table Structure

- GSUB Table
    - Script1
      - Language1
        - FeatureA
          - Substitution Type
        - FeatureB
          - Substitution Type
      - Language2
        - FeatureA
          - Substitution Type
        - FetaureC
          - Substitution Type
    - Script2
      - Language1
        - FetaureD
          - Substitution Type
- GSUB Table
  - Arabic
    - DFT
      - INIT
        - ع → ء
      - MEDI
        - ع → \*
        - ت → ٲ
      - FINA
        - ت → ٲ
    - Latin
      - ENG
        - LIGA
          - ff → ff

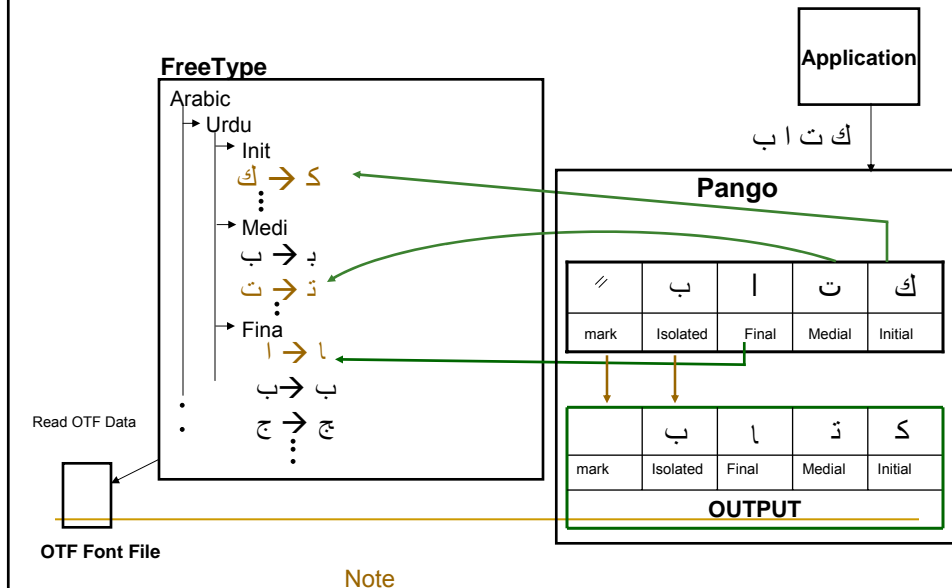
## Unicode Script Processor

- Looks up the OpenType tables and performs text processing
- Exists in Windows as USP10.dll

## Major Players (Gnome): FreeType & Pango

- FreeType
  - Font File Reader i.e. it is capable of physically reading the contents of different font files including OpenType
  - Stores all OpenType rules within its local data structures
  - But it CANNOT process OpenType rules
- Pango
  - Pango is a layer one level higher than FreeType
  - It 'applies' the rules on the input string.

## Major Players



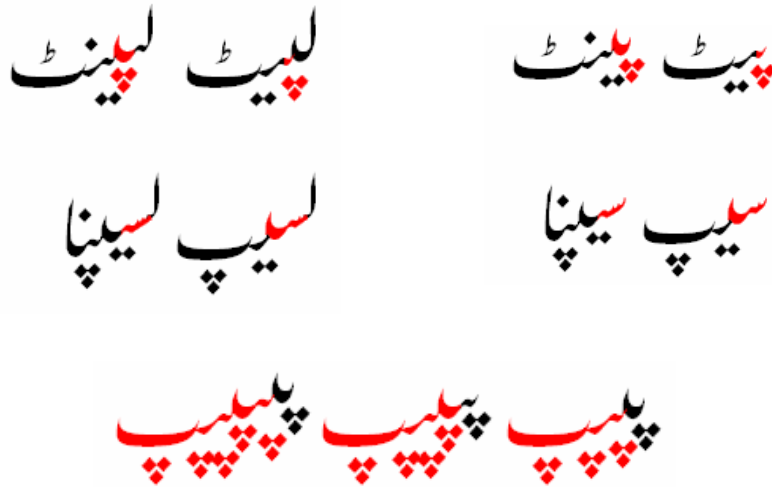
## The Lookup Processing Algorithm

- A Lookup...
- Input String of n letters
- Number of Lookups = LK

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For (i = 0 → LK)
  For (j = 0 → n)
    ApplyLookup( string, j, i, size);
  
```

## Shape of letter??



## Type 8 Reverse Chain Table

Type	Name	Description
uint16	SubstFormat	Format identifier-format = 1
Offset	Coverage	Offset to Coverage table - from beginning of Substitution table
uint16	BacktrackGlyphCount	Number of glyphs in the backtracking sequence
Offset	Coverage[BacktrackGlyphCount]	Array of offsets to coverage tables in backtracking sequence, in glyph sequence order
uint16	LookaheadGlyphCount	Number of glyphs in lookahead sequence
Offset	Coverage[LookaheadGlyphCount]	Array of offsets to coverage tables in lookahead sequence, in glyph sequence order
uint16	GlyphCount	Number of GlyphIDs in the Substitute array
GlyphID	Substitute[GlyphCount]	Array of substitute GlyphIDs-ordered by Coverage Index

## Dry Run



## References

- [1] <http://www.microsoft.com/typography/default.asp>
- [2] OpenType Specification v1.2, available at [www.microsoft.com/typography/tt/tt.htm](http://www.microsoft.com/typography/tt/tt.htm)
- [3] Microsoft, 1992, "TrueType Font Technology, An Overview of its Implementation in Microsoft Windows Version 3.1", Microsoft Corporation.
- [4] [www.freetype.org](http://www.freetype.org)
- [5] [www.unicode.org](http://www.unicode.org)
- [6] <http://www.microsoft.com/truetype/tt/tt.htm>
- [6] Hudson John, "Unicode from Text to type", Language Culture Type: International Type Design in the Age of Unicode, Typographique International, NY 2002.
- [7] <http://www.adobe.com/type/opentype/main.html>
- [8] <http://www.microsoft.com/typography/ofntdev/arabicot/default.htm>: "Creating and supporting OpenType fonts for the Arabic script" Microsoft 2001.
- [9] [www.Redhat.org](http://www.Redhat.org)
- [10] Phinney Thomas, "TrueType, PostScript Type 1 & OpenType: What's the difference?" December 2002.

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## Questions?

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## Why Shape Analysis

- Letters have 4 form in Arabic Script
- Urdu Derived from Arabic Script
  - Isolated
  - Initial
  - Medial
  - Fina

ع ا ب ج ع

## Why Shape Analysis

- Given a letter is in Initial, Medial or Final position, it can have different shapes depending on the context

ج ج ج ج ج