

Microsoft Font Validator 2015

Hin-Tak Leung

October 24, 2015

3 Versions

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- 8 Problematic parts at a glance

- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard

- Timeline

- 2003 vs 2009+

- 2003 vs 2009+, GUI

- XML Report Viewer

- Win32APIs

- WinVerifyTrustAPI

- Font Rasterer

- FreeType-based Font Rasterer (TBD)

- Win32 Hybrid Branch

- Enhancements to SharpFont 1

- Enhancements to SharpFont 2

- Enhancements to FreeType 1

- Enhancements to FreeType 2

- About specific fonts

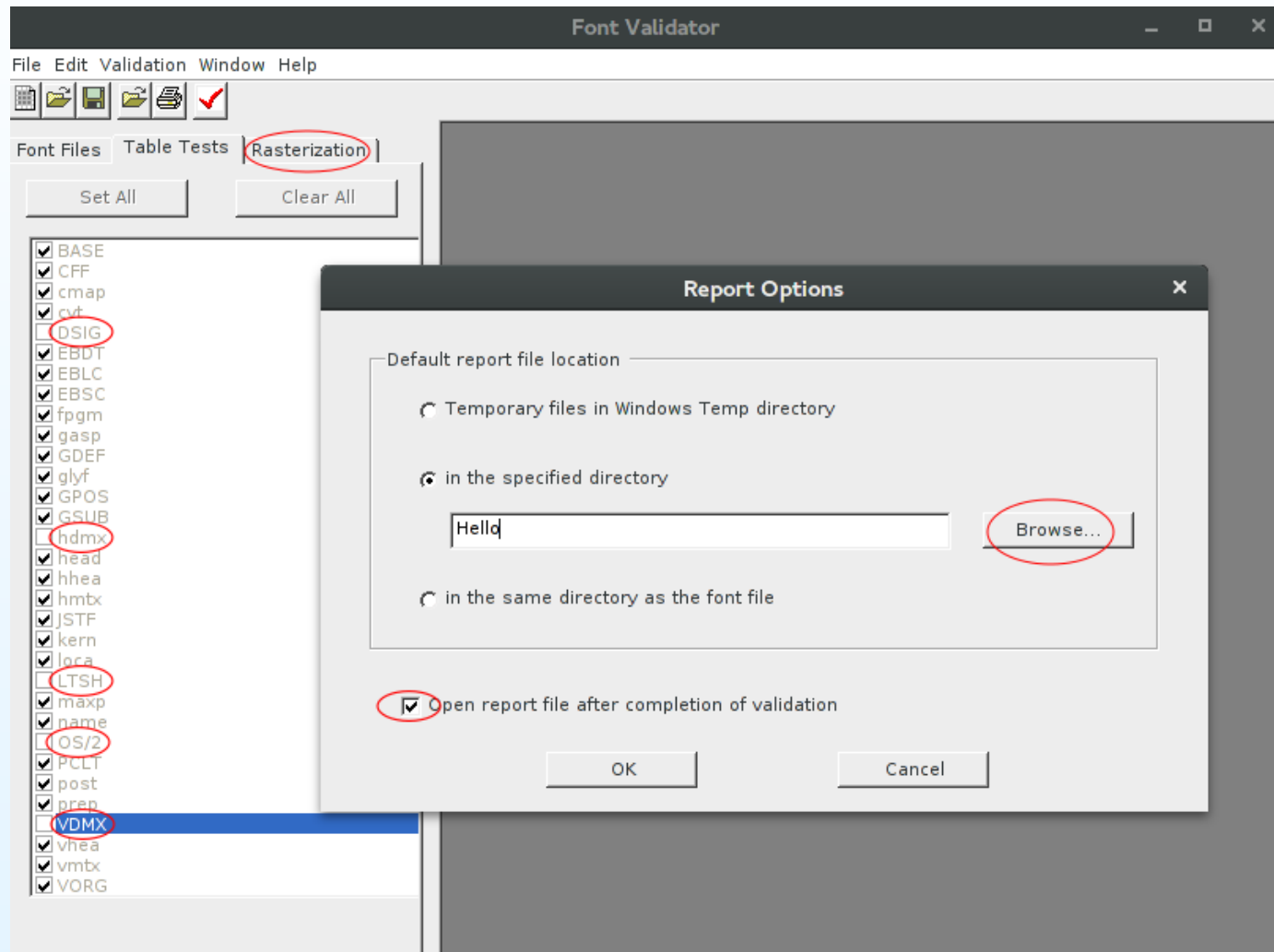
- Misc Tips

- Trivia

- 2003 (public binary) a.k.a. 1.0.1286.23890
- 2009 (Partial code snapshot, binary never? released to public)
 - missing windows-specific parts: XML viewer, Rasterer
 - no dev docs and no VS project files
 - More tests (194 vs 177); New command line batch tool.
 - 2nd code drop: Win32APIs, WinVerifyTrustAPI
- 2015 Open-sourced
 - Mono C# compiler and GNU Make-based build system
 - Rasterer replaced (partially as of Oct 2015) by FreeType
 - Win32APIs completely reimplemented
 - other and misc enhancements/bug-fixes, for OS X fonts
 - esp. usability of the CUI tool; backported to 2003 also.
 - Still missing some functionalities (as of Oct 2015)
 - DSIG, Rasterization, XML Report Viewer

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- Timeline
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- 2003 vs 2009+, GUI
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- Win32APIs
- WinVerifyTrustAPI
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- Enhancements to SharpFont 2
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- Enhancements to FreeType 2
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- 4 (the HDMX, LTSH, VDMX table tests and the Rasterization test) depends on font scaler
- OS/2 table test does codepage related calls
- DSIG digital signature table test calls windows security APIs
- “Browse” button for report-save option is hooked up to windows explorer’s browse function
- “Open report file after completion of validation” option does not work — the XML viewer depends on MS Internet Explorer

MS OT Spec, ISO/IEC 14496-22 Open Font Format standard

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- 8 Problematic parts at a glance

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Open Font Format
standard

- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to SharpFont 2
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- Enhancements to FreeType 2
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- Version 1.4 - Released 11 October 2002
 - ISO/IEC 14496-22:2007 (1st edition)
- Version 1.5 - Released May 2008
- Version 1.6 - Released April 2009 (updated July 2010)
 - ISO/IEC 14496-22:2009 (2nd edition)
 - ISO/IEC 14496-22:2009 — Technical Corrigendum 1
 - ISO/IEC 14496-22:2009/Amd 1:2010
 - — Support for many-to-one range mappings
 - ISO/IEC 14496-22:2009/Amd 2:2012
 - — Additional script and language tags
- Version 1.7 - Released March 2015
 - ISO/IEC 14496-22:2015 (3rd edition)

Timeline

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- **Timeline**

- 2003 vs 2009+
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- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to FreeType 2
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- 2015 June 10: Discussion started on freetype-devel, moved to small group e-mails soon after
- 2015 Aug 6: Signed agreement
- 2015 Aug 11: First code drop
- 2015 Aug 14: 189/194 Mono-build'able bundle back to Microsoft for review and approval for release
- 2015 Aug 31 ~ Sept 3: 193/194 build functional, testing, debugging
- 2015 Sept 14: 193/194 RFC release
 - Tidy up, and dual Windows 32-bit/64-bit build
- 2015 Sept 19: Second code drop
- 2015 Oct 4: FreeType 2.6.1 out (containing submitted enhancement)
- 2015 Oct 10: Two RFC releases
 - Code Pages sync to Win8.1, FreeType 2.6.1
 - Win32 hybrid-branch build

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- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
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- Enhancements to FreeType 2
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Timeline

- 2015 Aug 3: Hacked-up 2003 binary, run'able on Linux
- 2015 Aug 11: First code drop
- 2015 Aug 14: 189/194, sent back to MS
- 2015 Aug 17: 190/194, OS/2 Code Pages
- 2015 Aug 25: 191/194, HDMX
 - soon realize need to extend FreeType
- 2015 Aug 28: 192/194, LTSH
- 2015 Aug 31: 193/194, VDMX
-
- 2015 Oct 24: First version of this slide set.

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- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to FreeType 2
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- 177 vs 194 Tables tests (on 32 tables)
- 1 vs 3 Rasterization tests (BW, Gray, ClearType)
 - FreeType-based replacement not yet started in Oct 2015
- 10% tolerance silencing in 2009+ for **VDMX** disagreement
- New command line batch tool is functional, but. . .

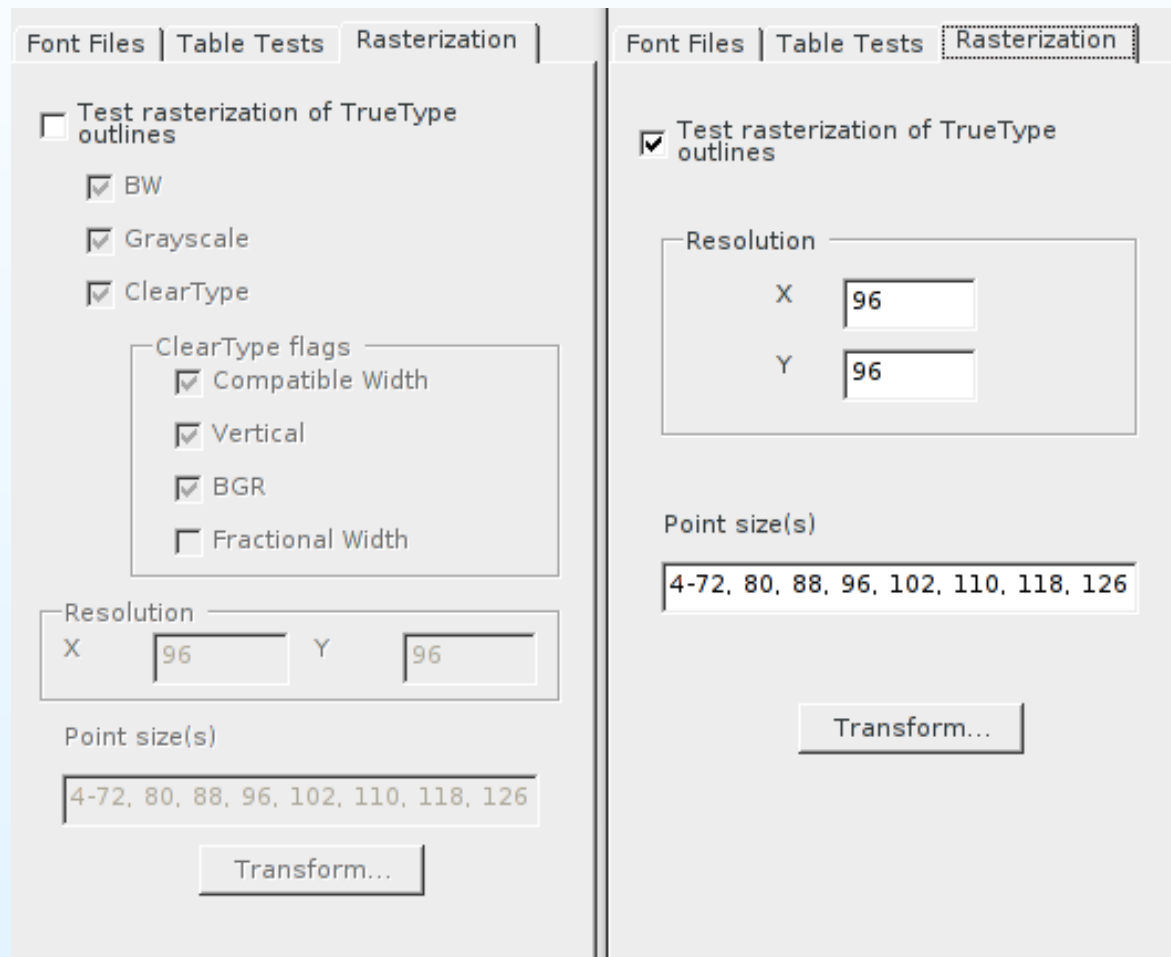
```
Usage: FontValidator [options]
Options
<to be written>
```

- Looked at the source code to find out how to run it!
- Documented such findings afterwards, in 2015. . .

2003 vs 2009+, GUI

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- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- **2003 vs 2009+, GUI**
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- 3 Rasterization modes, and many more options for ClearType in 2009+



XML Report Viewer

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- ActiveX and Internet Explorer-based.
- Resides in `AxInterop.SHDocVw.dll`, `Interop.SHDocVw.dll`, `Microsoft.mshtml.dll`
- Replacement likely based on Firefox, `Mono.WebBrowser (gecko)`

Win32APIs

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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```
BOOL kernel32.GetCPInfo( UINT CodePage, LPCINFO lpCPInfo )
BOOL kernel32.IsValidCodePage( UINT CodePage )
BOOL kernel32.IsDBCSLeadByteEx( UINT CodePage, BYTE TestChar )
int kernel32.MultiByteToWideChar( UINT CodePage, ... )

LPITEMIDLIST shell32.SHBrowseForFolderA ( LPBROWSEINFOA lpbi )
```

- Used by OS/2 CodePage test and GUI's XML report save directory option
- Replaced by built-in encoding tables sync to Windows 8.1
 - **Note** on Code Page's: 2003 binary behaves differently depends on vintage of windows host OS.
 - Note also, Mono and Wine's implementation of windows code pages are incomplete and inconsistent in different ways. (bugs filed)

WinVerifyTrustAPI

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- **WinVerifyTrustAPI**
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to SharpFont 1
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- required by DSIG test
- also need `mssipotf.dll` registration
- Stubbed; Full replacement unimplemented as of Oct 2015.
 - likely based on `openssl`, and maybe also `harfbuzz`

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- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- **Font Rasterer**
- FreeType-based Font Rasterer (TBD)
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- Enhancements to SharpFont 2
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- Required by HDMX, LTSH, VDMX, and Rasterization
- Resides in `truetype.dll`
 - Must be similar or identical to `win32k.sys?` and `CacheTT?`
 - Cannot process CFF opentype fonts
 - Fails to process many fonts shipped in current Mac OS X
 - 20% of the fonts on Mac OS X (369): ~ 20 fail with rasterer error, ~ 50 with large #s of obviously wrong zero calculated x advances
 - Mac OS X ships FreeType(?) as part of CoreGraphics
 - mis-process Win 8.1's `symbol.ttf`

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- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- **Font Rasterer**
- FreeType-based Font Rasterer (TBD)
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- FreeType based **HDMX**, **LTSH**, **VDMX** Calculations
 - Expect \sim 1-pixel difference on either side (i.e. 2 pixels for **HDMX**; **VDMX**'s ymax and ymin can each differ by up to 1)
 - **LTSH** linearity agreement is difficult to match
 - Agree well on *which* glyphs are non-linear.
 - Font designers should err on larger side
 - **Note:** 2003 **VDMX** Calc for non-square resolutions is wrong.
 - Calculation of **HDMX**, **LTSH**, **VDMX** (using FreeType on windows) $\sim \times 4$ faster than 2003 binary
 - \sim 4 minutes for the largest fonts under FreeType
 - progress update and responsiveness to cancel may differ
 - works well (better?) with Mac OS X fonts
 - Enhancement went into FreeType 2.6.1 (and SharpFont 3.0.1+? TBD)

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- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- **Font Rasterer**
- FreeType-based Font Rasterer (TBD)
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- FreeType HDMX: Among 276 Win 8.1 fonts and 369 OS X Yosemite fonts (i.e. 645), about half are either mono or missing HDMX tables. Out of the rest, just under 1/2 is a totally OK table; if I allow for up to 2 pixels difference, than it becomes a bit over 3/4.

FreeType-based Font Rasterer (TBD)

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32 APIs
- WinVerifyTrust API
- Font Rasterer
- **FreeType-based Font Rasterer (TBD)**
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- Enhancements to SharpFont 1
- Enhancements to SharpFont 2
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- Can process CFF (TBD), and for `head_MinMaxValues`, `hhea_MinMax`, `OS/2_xAvgCharWidth` tests.
- Rasterization? (TBD)
 - `FT_LOAD_PEDANTIC`, `docs/DEBUG`, `FT2_DEBUG=ttinterp:7 any:1`, `TT_INTERPRETER_VERSION_38`, `FT_LOAD_MONOCHROME`, `FT_LOAD_RENDER`, `FT_RENDER_MODE_MONO`, `FT_LOAD_TARGET_MONO`
 - The rasterization test(s) will be somewhat difficult/time-consuming to do, as testing on a small non-CJK font like Arial takes typically 1/2 hour.

Win32 Hybrid Branch

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- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- **Win32 Hybrid Branch**
- Enhancements to SharpFont 1
- Enhancements to SharpFont 2
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- Enhancements to FreeType 2
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- uses dlls from 2003 binary to fill in gaps in functionality
 - interrim measure; will not be maintained/extended
- requires manual registration of `mssipotf.dll` for DSIG
- Windows only, 32-bit or WoW64
- works OK under wine + dotnetfx at about 1/4 speed
- does not work correctly under wine-mono (as of 4.5.6)
- consists of 6 code changes and 3 binary changes:
 - 1 addition and 1 revert in `Compat/Compat.cs`, 1 revert in `FontVal/ResultsForm.cs` to re-enable IE-based XML viewer, removing `Compat/WinVerifyTrustAPI.cs`, and 2 adjustments in the `Makefile`
 - remove 64-bit freetype dlls, move 32-bit freetype dlls from sub-dir, and copy dlls from 2003 binary
- see `README-hybrid.txt` for details.

Enhancements to SharpFont 1

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- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to SharpFont 2
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SharpFont (= FreeType C# binding) 3.0.1+? TBD:

```
commit e20f1a46a0832cea7e207eacd8fb46a46a4cdb64
Merge: 74e3b08 7c547f8
Author: Robert Rouhani <robert.rouhani@gmail.com>
Date: Mon Sep 21 21:06:33 2015 -0400
```

Merge pull request #58 from HinTak/master

issues of building on case-sensitive file system.

```
commit 74e3b089fc3b81beec47efbefde8f6d766d5f2ea
Author: Hin-Tak Leung <htl10@users.sourceforge.net>
Date: Wed Aug 26 04:48:18 2015 +0100
```

adding ComputeMetrics

Signed-off-by: Hin-Tak Leung <htl10@users.sourceforge.net>
Signed-off-by: Robert Rouhani <robert.rouhani@gmail.com>

Enhancements to SharpFont 2

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
- Enhancements to SharpFont 1
- **Enhancements to SharpFont 2**
- Enhancements to FreeType 1
- Enhancements to FreeType 2
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- Misc Tips
- Trivia

SharpFont requires extra patch to FreeType on 64-bit windows. See `freetype-win64-2.6.1.patch` . And this:

```
commit 4187753970107f5892df78dad87968ab2ffb1b28
Author: Werner Lemberg <wl@gnu.org>
Date: Sat Sep 26 15:19:54 2015 +0200
```

```
[bzip2, gzip, lzw] Harmonize function signatures with prototype.
```

```
Suggested by Hin-Tak Leung.
```

```
* src/bzip2/ftbzip2.c (ft_bzip2_stream_io), src/gzip/ftgzip.c
(ft_gzip_stream_io), src/lzw/ftlzw.c (ft_lzw_stream_io): Do it.
```

Enhancements to FreeType 1

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- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
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- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
- Enhancements to SharpFont 1
- Enhancements to SharpFont 2
- **Enhancements to FreeType 1**
- Enhancements to FreeType 2
- About specific fonts
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- Trivia

FreeType 2.6.1:

```
commit 8cabd919ca63f0e6c12e8405e8542a45d910fa62
Author: Werner Lemberg <wl@gnu.org>
Date:   Sun Oct 4 08:18:01 2015 +0200
```

* Version 2.6.1 released.

```
commit b8398720556ae561d568361f73733978b7730db7
Author: Hin-Tak Leung <htl10@users.sourceforge.net>
Date:   Wed Sep 9 18:56:46 2015 +0100
```

Stray character in ChangeLog.21.

Signed-off-by: Hin-Tak Leung <htl10@users.sourceforge.net>

```
commit 265ade8e807819e6a3f93671df1382c56ba50f85
Author: Hin-Tak Leung <htl10@users.sourceforge.net>
Date:   Sat Sep 26 14:51:30 2015 +0200
```

Add new FT_LOAD_COMPUTE_METRICS load flag.

* include/freetype/freetype.h (FT_LOAD_COMPUTE_METRICS): New macro.
* src/truetype/ttgload.c (compute_glyph_metrics): Usage.

Enhancements to FreeType 2

- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
- Enhancements to SharpFont 1
- Enhancements to SharpFont 2
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- Enhancements to FreeType 2
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Mentioned in Release Note:

CHANGES BETWEEN 2.6 and 2.6.1

III. MISCELLANEOUS

- A new load flag 'FT_LOAD_COMPUTE_METRICS' has been added; it makes FreeType ignore pre-computed metrics, as needed by font validating or font editing programs. Right now, only the TrueType module supports it to ignore data from the 'hdmx' table.

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- 8 Problematic parts at a glance
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- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
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- Enhancements to SharpFont 2
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- Enhancements to FreeType 2
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- Mainly tested on windows 8.1 fonts (276 files with 323 typefaces); and 369 OS X shipped fonts occasionally. 645 in total.
- Have not found any CFF with HDMX/VDMX/LTSH for testing
- Have not found fonts with invalid signature for testing
- Saab.otf on Linux is not a CFF.
- cour.ttf on MS have both bdat and EBDT, and bloc and EBLC.
- LaoUIb.ttf and LaoUI.ttf on MS contain “Instruction is only valid on the Apple platform”
- Apple Color Emoji.ttf is difficult in quite a few ways: It is a monospace font, but have redundant HDMX table; it is a “text” font with unicode encoding beyond the basic plane, but does not have a MS 3.10 charmap. It supports only a few pixel sizes but have HDMX tables for sizes beyond those.
- Apple algers.ttf has some anomalies.

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- 3 Versions
- 8 Problematic parts at a glance
- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
- Win32 Hybrid Branch
- Enhancements to SharpFont 1
- Enhancements to SharpFont 2
- Enhancements to FreeType 1
- Enhancements to FreeType 2
- About specific fonts
- Misc Tips
- Trivia

- Cosimo uses iChm.app for chm viewing on OS X.
- On Linux (and sufficiently new mono? not in 3.10.0 but in 4.0.2), mono automatically launch chmsee for chm viewing; set by MONO_HELP_VIEWER .
- Do not compile FreeType with TT_CONFIG_OPTION_SUBPIXEL_HINTING (Not default, but “make devel” does it).

Trivia

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- MS OT Spec, ISO/IEC 14496-22 Open Font Format standard
- Timeline
- 2003 vs 2009+
- 2003 vs 2009+, GUI
- XML Report Viewer
- Win32APIs
- WinVerifyTrustAPI
- Font Rasterer
- FreeType-based Font Rasterer (TBD)
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- Enhancements to FreeType 2
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- Trivia

- 2009+ : number of code lines of C# = 74 weeks (~ 18 man-months) \times 200 lines per day (a typical figure)