SIGNALSEC
BEYOND INTELLIGENCE

BREAKING FONT PARSERS

CELIL UNUVER – BEKIR KARUL

Who we are?

- Celil UNUVER @celilunuver
  - Founder and Researcher @SignalSEC Ltd.
  - Organizer of NOPcon Hacker Conference
  - Vuln Research, RE, Fuzzing and SCADA
  - Speaker at CODE BLUE, CONFidence 2010, Swiss Cyber Storm, DefCamp

- Bekir KARUL @bek_phys
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  - Windows Internals, Malware, RE
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Agenda

I. Introduction to Fonts
II. TTF Structure
III. Kırlangıç TTF Fuzzer
IV. Generating test cases with fuzzed TTF
V. Fuzzing Results
VI. Questions

Font Types

- Applications can use four different kinds of GDI font technologies to display and print text
  1. Raster
  2. Vector
  3. **TrueType**
  4. Microsoft OpenType
- The GDI(Graphis Device Interface) is part of the core operating system component responsible for representing graphical objects and transmitting them to output devices such as monitors and printers.
- The differences between these fonts reflect the way that the glyph for each character or symbol is stored in the respective font-resource file

Font Types

Raster : a glyph is a bitmap that the system uses to draw a single character in the font.

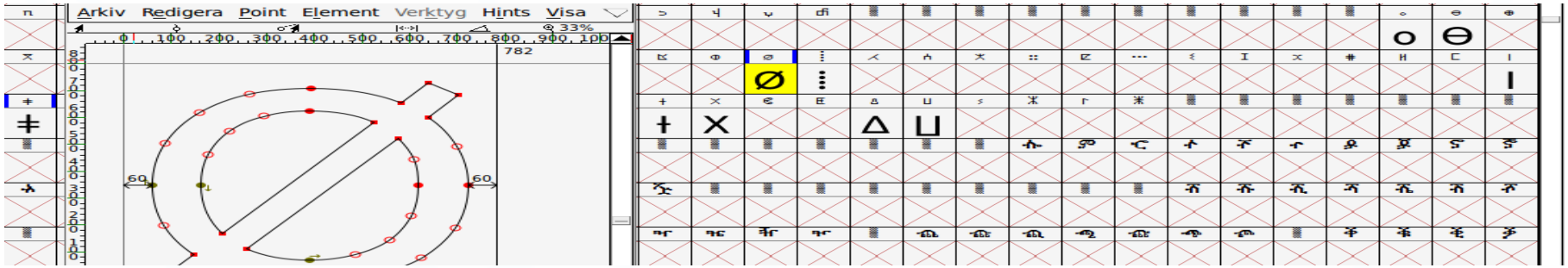
Vector : a glyph is a collection of line endpoints that define the line segments that the system uses to draw a character in the font.

TrueType & OpenType : a glyph is a collection of line and curve commands as well as a collection of hints.

http://msdn.microsoft.com/en-us/library/dd162893(v=vs.85).aspx

TrueType Font

- A TrueType font file contains data in table format, that comprises an outline font
- And the raster device uses combinations of data from different tables to render the glyph data in the font.
- You can use TrueTypeViewer, FontForge and TTFDump as font editor/viewer



TrueType Font Structure

- 010 Editor is probably best choice for viewing/editing files
- There are many file format templates for 010 Editor including TTF!
- We modified 010 Editor's TTF template a bit for readability, here is example

YourHandwriting.ttf

Edit As: Hex Run Script Run Template: TTFTemplate.bt

```
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F    0123456789ABCDEF
0000h: 00 01 00 00 00 0B 00 80 00 03 00 30 4F 53 2F 32  .......€...0OS/2
0010h: 3D ED 7C 58 00 00 01 38 00 00 00 4E 63 6D 61 70  =í|X...8...Ncmap
0020h: E3 B3 43 8B 00 00 03 10 00 00 00 CE 67 61 73 70  ã³C‹.......Îgasp
0030h: FF FF 00 03 00 00 45 C4 00 00 00 08 67 6C 79 66  ÿÿ....EÄ....glyf
0040h: 10 14 1E DC 00 00 04 A8 00 00 3C A0 68 65 61 64  ...Ü...¨..< head
0050h: DE EB 9A 75 00 00 00 BC 00 00 00 36 68 68 65 61  Þëšu...¼...6hhea
0060h: 0D 46 04 CE 00 00 00 F4 00 00 00 24 68 6D 74 78  .F.Î...ô...$hmtx
0070h: 3D 0D 11 BB 00 00 01 88 00 00 01 88 6C 6F 63 61  =..»...ˆ...ˆloca
0080h: 07 10 F7 DA 00 00 03 E0 00 00 00 C6 6D 61 78 70  ..÷Ú...à...Æmaxp
0090h: 00 CC 00 D8 00 00 01 18 00 00 00 20 6E 61 6D 65  .Ì.Ø....... name
```

Template Results - TTFTemplate.bt

Name	Value	Start
struct FontOffsetTable OffsetTable		0h
TT_Fixed SFNT_Ver	65536	0h
USHORT numTables	11	4h
USHORT searchRange	128	6h
USHORT entrySelector	3	8h
USHORT rangeShift	48	Ah
struct FontTableDirectory Table[11]		Ch
struct FontTableDirectory Table[0]	OS/2 (1330851634) at 312 for 78	Ch
struct FontTableDirectory Table[1]	cmap (1668112752) at 784 for 206	1Ch

http://www.sweetscape.com/010editor/templates/

TrueType Font Structure

- TTF font begins at byte 0 with the Font Offset Table
- Font Offset Table have 5 subtable:

SFNT_Ver : Version information 65536 for version 1.0
numTables : Number of tables
searchRange : (Maximum power of 2 ≤ numTables) x 16
entrySelector : Log2(maximum power of 2 ≤ numTables)
rangeShift : numTables x 16-searchRange

struct FontOffsetTable OffsetTable	
TT_Fixed SFNT_Ver	65536
USHORT numTables	11
USHORT searchRange	128
USHORT entrySelector	3
USHORT rangeShift	48

TrueType Font Structure

- This table followed at byte 12 by the Table Directory entries
- Each entry have 4 member
- And Table Directory entries must be sorted in ascending order by tag

tag : 4 byte identifier
checkSum : 4 byte checksum value of this table
offset : Offset from beginning
length : Length of this table

struct FontTableDirectory Table[7]	loca (1819239265) at 992 for 198	7Ch	10h
union Tag		7Ch	4h
ULONG checkSum	118552538	80h	4h
ULONG offset	992	84h	4h
ULONG length	198	88h	4h

- Important to say that we should NEVER fuzz these fields : checkSum, offset, length

- What is table checksum?
  - Table checksums are the unsigned sum of a given table.
  - We can calculate it by this little python code

```
totalData = 0
for i in range(0, len(tableD), 4):
    data = unpack(">I", tableD[i:i+4] ) [0]
    totalData += data
finalData     = 0xffffffff & totalData
```

  - This function implies that the length of a table must be multiple of four bytes. If not, you need to fill remaining with zeros

```
#Check if we need to adjust table lenght (When len(table) % 4 != 0)
fourFix = False
if len(tableData) % 4 != 0:
    fourFix        = True
    fixedSize      = ((len(tableData) + 3 ) & ~3) - len(tableData)
    tempTableData  = tableData + (fixedSize * "0")
```

- Example

```
0030h: FF FF 00 03 00 00 45 C4 00 00 00 08 67 6C 79 66  ÿÿ....EÄ....glyf
0040h: 10 14 1E DC 00 00 04 A8 00 00 3C A0 68 65 61 64  ...Ü...¨..< head
0050h: DE EB 9A 75 00 00 00 BC 00 00 00 36 68 68 65 61  Þëšu...¼...6hhea
0060h: 0D 46 04 CE 00 00 00 F4 00 00 00 24 68 6D 74 78  .F.Î...ô...$hmtx
0070h: 3D 0D 11 BB 00 00 01 88 00 00 01 88 6C 6F 63 61  =..»...ˆ...ˆloca
0080h: 07 10 F7 DA 00 00 03 E0 00 00 00 C6 6D 61 78 70  ..÷Ú...à...Æmaxp
```

Template Results - TTFTemplate.bt

Name	Value	Start
struct FontTableDirectory Table[2]	gasp (1734439792) at 17860 for 8	2Ch
struct FontTableDirectory Table[3]	glyf (1735162214) at 1192 for 15520	3Ch
struct FontTableDirectory Table[4]	head (1751474532) at 188 for 54	4Ch
union Tag		4Ch
ULONG checkSum	3739982453	50h
ULONG offset	188	54h
ULONG length	54	58h
struct FontTableDirectory Table[5]	hhea (1751672161) at 244 for 36	5Ch
struct FontTableDirectory Table[6]	hmtx (1752003704) at 392 for 392	6Ch
struct FontTableDirectory Table[7]	loca (1819239265) at 992 for 198	7Ch
struct FontTableDirectory Table[8]	maxp (1835104368) at 280 for 32	8Ch
struct FontTableDirectory Table[9]	name (1851878757) at 16712 for 909	9Ch
struct FontTableDirectory Table[10]	post (1886352244) at 17624 for 236	ACh
struct thead head		BCh
struct thhea hhea	v1.00 98 hmtx records	F4h
struct thmtx hmtx	98 HMetrics 0 leftSideBearing	188h

- Also we have another checksum for entire font
- To compute it:

1. Set **checkSumAdjustment** to 0 in **head** table
2. Calculate the checksum for all the tables and enter that value into the table directory
3. Calculate the checksum for the entire font
4. Calculate 0xB1B0AFBA - sum
5. Store result in **checkSumAdjustment**

```
for i in range(0, len(tempFont), 4):
    data      = unpack(">I", tempFont[i:i+4] ) [0]
    totalData += data

finalData = totalData & 0xffffffff
finalData = (0xb1b0afba - finalData)
```

TrueType Font Structure

- There are 2 types of tables

1. Required

cmap	character to glyph mapping
glyf	glyph data
head	font header
hhea	horizontal header
hmtx	horizontal metrics
loca	index to location
maxp	maximum profile
name	naming table
post	PostScript information
OS/2	OS/2 and Windows specific metrics

TrueType Font Structure

- There are 2 types of tables

2. Optional

cvt	Control Value Table
EBDT	Embedded bitmap data
EBLC	Embedded bitmap location data
EBSC	Embedded bitmap scaling data
fpgm	font program
gasp	grid-fitting and scan conversion procedure (grayscale)
hdmx	horizontal device metrics
kern	kerning
LTSH	Linear threshold table
prep	CVT Program
PCLT	PCL5
VDMX	Vertical Device Metrics table
vhea	Vertical Metrics header
vmtx	Vertical Metrics

Note that the number 0 is never a valid tag name.

TrueType Font Structure

- TTF structure is designed to keep the entire glyph data in various table
- Three new tables are used to embed bitmaps in TrueType fonts

  I. EBDT – for embedded bitmap data
  II. EBLC – for embedded bitmap locators
  III. EBSC – for embedded bitmap scaling information

- The raster device which we was mentioned previously is generally uses this tables to render the glyph data

- What is glyph data? (glyf table)
  - This table contains information that describes the glyphs in the font
  - Each glyph begins with the following header

numberOfContours	If the number of contours is greater than or equal to zero, this is a single glyph; if negative, this is a composite glyph.
xMin	Minimum x for coordinate data.
yMin	Minimum y for coordinate data.
xMax	Maximum x for coordinate data.
yMax	Maximum y for coordinate data.

- What is name table?
  - The naming table allows multilingual strings to be associated with the TrueType font file. These strings can represent copyright notices, font names, family names, style names, and so on.

The format o Naming Table is organized as follows:

Type	*Name*	*Description*
USHORT	format	Format selector (=0).
USHORT	count	Number of name records.
USHORT	stringOffset	Offset to start of string storage (from start of table).
NameRecord	nameRecord[count]	The name records where *count* is the number of records.
(Variable)	Storage for the actual string data.	

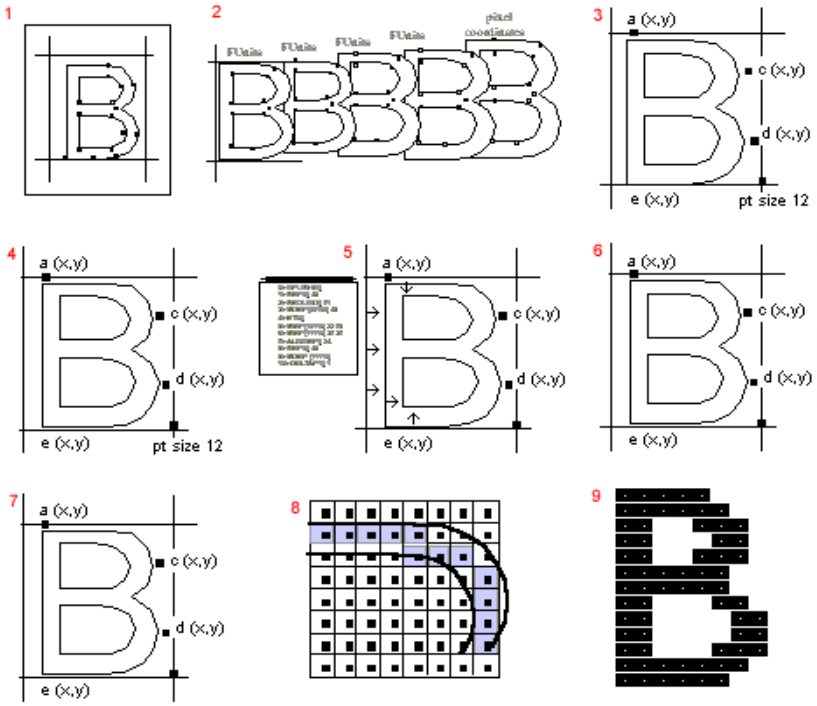
Name Records

Each *NameRecord* looks like this:

Type	*Name*	*Description*
USHORT	platformID	Platform ID.
USHORT	encodingID	Platform-specific encoding ID.
USHORT	languageID	Language ID.
USHORT	nameID	Name ID.
USHORT	length	String length (in bytes).
USHORT	offset	String offset from start of storage area (in bytes).

TrueType Font Structure

- Anybody font designer here?
- So we do not need further examination of boring font structure



More information about TTF : TrueType 1.0 Font Files Technical Specification (1995)

```
E:\BOCUK\Projects\Kirlangic>kirlangic.py -h
usage: kirlangic.py [-h] [-i] [-fuzzvalue ff] [-o fuzzedfiles]
                    [-od fuzzeddocx] [-op fuzzedpdf] [-m 10000] [-docx] [-pdf]

Kirlangic TTF Fuzzer - v1.2
SIGNALSEC

optional arguments:
  -h, --help      show this help message and exit
  -i              ttf input
  -fuzzvalue ff   fuzz value
  -o fuzzedfiles  fuzzed files output dir
  -od fuzzeddocx  docx output dir
  -op fuzzedpdf   pdf output dir
  -m 10000        max lenght of table
  -docx           create docx files
  -pdf            create pdf files

Usage:
./kirlangic.py -i ttfFile.ttf
```

KIRLANGIC TTF FUZZER

Kırlangıç TTF Fuzzer

- Created to fuzz TTF font and generate test cases with fuzzed TTF files
- Byte-flipping method
- It's structure aware (can fix table checksums etc.)
- It can generate Doc, Java, Silverlight, PDF test cases
- Will be public after the talk (https://github.com/signalsec)

Kırlangıç TTF Fuzzer

```
[!] Number of tables: 11

No  Table       Checksum        Offset   Lenght
-----------------------------------------------
00  OS/2        3ded7c58        00000138 0000004e
01  cmap        e3b3438b        00000310 000000ce
02  gasp        ffff0003        000045c4 00000008
03  glyf        10141edc        000004a8 00003ca0
04  head        deeb9a75        000000bc 00000036
05  hhea        0d4604ce        000000f4 00000024
06  hmtx        3d0d11bb        00000188 00000188
07  loca        0710f7da        000003e0 000000c6
08  maxp        00cc00d8        00000118 00000020
09  name        8cacc3aa        00004148 0000038d
10  post        78977afa        000044d8 000000ec
```

- We can use 2 types of fuzzing in TTF files

1. **Dumb Fuzzing**

*Simply alter TTF file without awareness of its data structure

- Dumb Fuzzing Sucks in TTF

2. Smart Fuzzing

*Simply alter TTF file with awareness of its data structure. In this type of fuzzing, we will not alter structure members like checksum, table name etc..

Kırlangıç TTF Fuzzer

- Fuzz process
  1. Get table information for each table(Table name, Checksum, Offset, Offset length)
  2. Fuzz it and generate fuzzed TTF files
  3. Do it again for other tables
  4. Generate test cases
  5. Send it to God damn font parsers

Kırlangıç TTF Fuzzer

To sum up here is our pseudo code of fuzz process:

```
for i=1; i<= Number of tables; i++:
        get table information here
        .......
        fuzzit(TTF File, Table Offset, Table length, Table no)

fuzzit:
   table Data  = TTF File[Table Offset:Table Offset+Table length]
   table Data Hex = table Data.encode("hex")

   while start < table length:
      table Data Hex[start] = `FUZZ DATA`
      table Fuzzed Data = Table Data.decode("hex")
      create TTF File(TTF File, tableFuzzedData, start, Table no, table offset)
      start++
```

Kirlangic TTF Fuzzer

- Here is an example fuzzed table; «naming» table

Startup | table16offset103.ttf

Edit As: Hex | Run Script | Run Template: TTFTemplate.bt

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	0123456789ABCDEF
1:2050h:	00	00	00	00	00	08	00	0C	02	27	00	01	00	00	00	00	.....'.....
1:2060h:	00	09	00	0C	02	4E	00	01	00	00	00	00	00	0A	00	38	.....N.....8
1:2070h:	02	CD	00	01	00	00	00	00	00	12	00	08	03	18	00	03	.Í.....
1:2080h:	00	01	04	09	00	00	00	70	00	00	00	03	00	01	04	09	.....p.....
1:2090h:	00	01	00	10	00	AB	00	03	00	01	04	09	00	02	00	0E	.....«.....
1:20A0h:	00	C6	00	03	00	01	04	09	00	03	00	36	00	DE	00	03	.Æ.....6.Þ..
1:20B0h:	00	01	04	09	00	04	FF	FF	01	32	00	03	00	01	04	09	.....ÿÿ.2.....
1:20C0h:	00	05	00	1A	01	4D	00	03	00	01	04	09	00	06	00	10	.....M.....
1:20D0h:	01	77	00	03	00	01	04	09	00	07	00	50	01	92	00	03	.w.....P.'..
1:20E0h:	00	01	04	09	00	08	00	18	02	0D	00	03	00	01	04	09	.....
1:20F0h:	00	09	00	18	02	34	00	03	00	01	04	09	00	0A	00	70	.....4.....p
1:2100h:	02	5B	00	03	00	01	04	09	00	12	00	10	03	06	00	43	.[.....C
1:2110h:	00	6F	00	70	00	79	00	72	00	69	00	67	00	68	00	74	.o.p.y.r.i.g.h.t
1:2120h:	00	20	00	28	00	63	00	29	00	20	00	32	00	30	00	31	. .(.c.). .2.0.1
1:2130h:	00	31	00	20	00	62	00	79	00	20	00	76	00	65	00	72	.1. .b.y. .v.e.r
1:2140h:	00	6E	00	6F	00	6E	00	20	00	61	00	64	00	61	00	6D	.n.o.n. .a.d.a.m
1:2150h:	00	73	00	2E	00	20	00	41	00	6C	00	6C	00	20	00	72	.s... .A.l.l. .r

Template Results - TTFTemplate.bt

Name	Value	Start	
struct tNameRecord NameRecord[16]		120AEh	0
USHORT platformID	3	120AEh	2
USHORT encodingID	1	120B0h	2
USHORT languageID	1033	120B2h	2
USHORT nameID	4	120B4h	2
USHORT length	65535	120B6h	2
USHORT offset	306	120B8h	2

Target ?

- Windows Kernel is not the only target
- Java, Adobe Flash, Office, Silverlight etc.

Oracle Java TrueType LookupCount Buffer Overflow Remote Code Execution Vulnerability

ZDI-14-038: April 3rd, 2014

Vulnerability Alert

Oracle Java mort TTF Table Remote Code Execution

Adobe Flash Player 11.3 Kern Table Parsing Integer Overflow

Let’s hunt the bugs

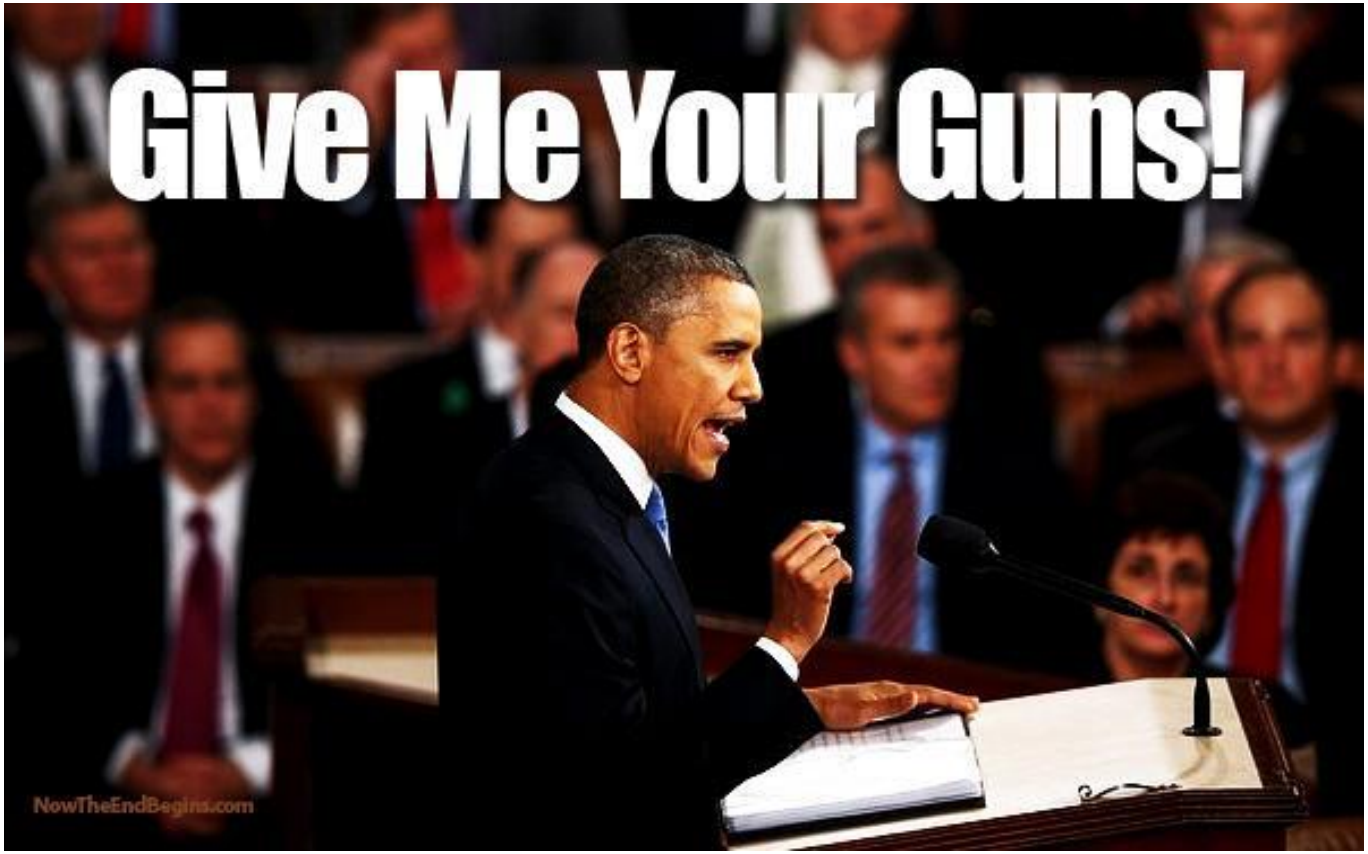


table10offset219.docx
table10offset220.docx
table10offset221.docx
table10offset222.docx
table10offset223.docx
table10offset224.docx
table10offset225.docx
table10offset226.docx
table10offset227.docx

```
----------- Docx generating ------------
Font info:
        Font: Dexter
        Key : F81ED81736AD4C7188D3E5A62FBAF834

[*] Fuzzed docx genarating...
[/] Total 335 fuzzed docx generated.

[!] Terminated by the user...
```

How to create Office Documents with fuzzed TTF file?

GENERATING TEST CASES WITH FUZZED TTF

- Generating office document

○ Microsoft Office using a file format called Office Open XML Format since Office 2007.

○ We can use any zip utility to open and modify its components.

- How to generate ODTTF ?
  - **ODTTF** is an embedded font file type used in Microsoft Office XML format.
  - An obfuscation against font file is used to prevent extracting it from Office document and using it.
  - To perform obfuscation, 16 byte GUID is generated for the each used font(in fontTable.xml)

```
<w:sig w:usb0="00000003" w:usb1="00000000" w:usb2="00000000" w:usb3="00000000" w:c
<w:embedRegular r:id="rId2" w:fontKey="{F81ED817-36AD-4C71-88D3-E5A62FBAF834}"/>
```

  - Then, a XOR operation is performed on the first 32 bytes of the font with the generated GUID;

```
#Create new ODTTF
for i in range(16):
    origFontL[i]    = ord(origFontR[i]) ^ ord(fontKey[15-i])
    origFontL[i+16] = ord(origFontR[i+16]) ^ ord(fontKey[15-i])
```

Generating Microsoft Office Documents

- Then, defined the font and font size that will be used in the document (in document.xml)

```
<w:pPr>
    <w:rPr>
        <w:rFonts w:ascii="Dexter" w:hAnsi="Dexter"/>
    </w:rPr>
</w:pPr>
<w:r w:rsidRPr="00E75B86">
    <w:rPr>
        <w:rFonts w:ascii="Dexter" w:hAnsi="Dexter"/>
        <w:sz w:val="8" />
        <w:szCs w:val="8" />
    </w:rPr>
    <w:t>:):):)</w:t>
```

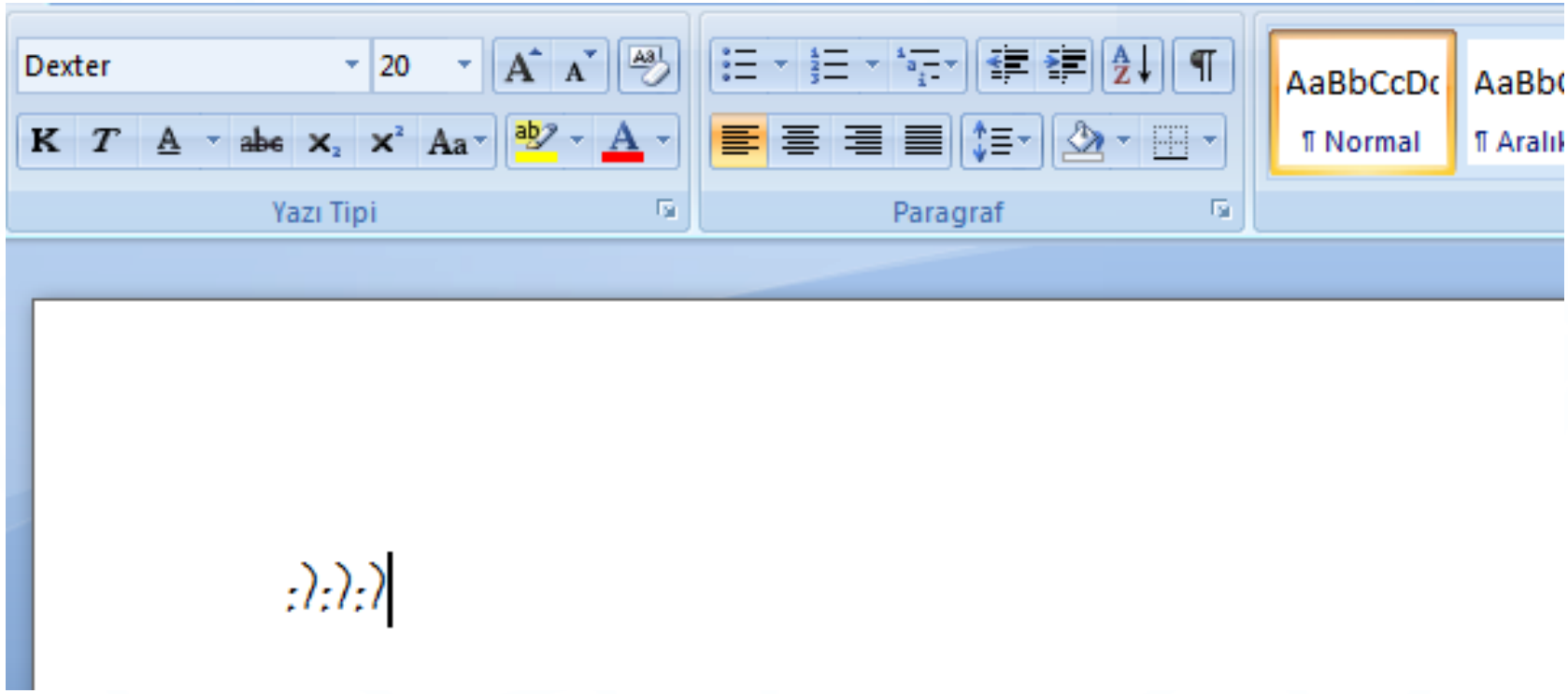
- Notice w:sz and w:rFonts fields

○ And finally compress these files with *make_archive* function (make_archive function is from shutil module) and rename it document.zip to document.docx

```
#Move fuzzed odttf to docx template
move("font1.odttf", "docTemplate/word/fonts")

#Set fuzzed docx name
sDfile = tFile.split(".ttf")[0]

#Create Docx under fuzzeddocx
make_archive(args.od + "/" + sDfile, "zip", "docTemplate")
try:
    rename(args.od + sDfile + ".zip", args.od + sDfile + ".docx")
except WindowsError:
    #Already exist, remove it first
    remove(args.od + sDfile + ".docx")
    rename(args.od + sDfile + ".zip", args.od + sDfile + ".docx")
```

P.S: Do not forget to create new GUID for each new font you will use.

- Result:



Generating PDF

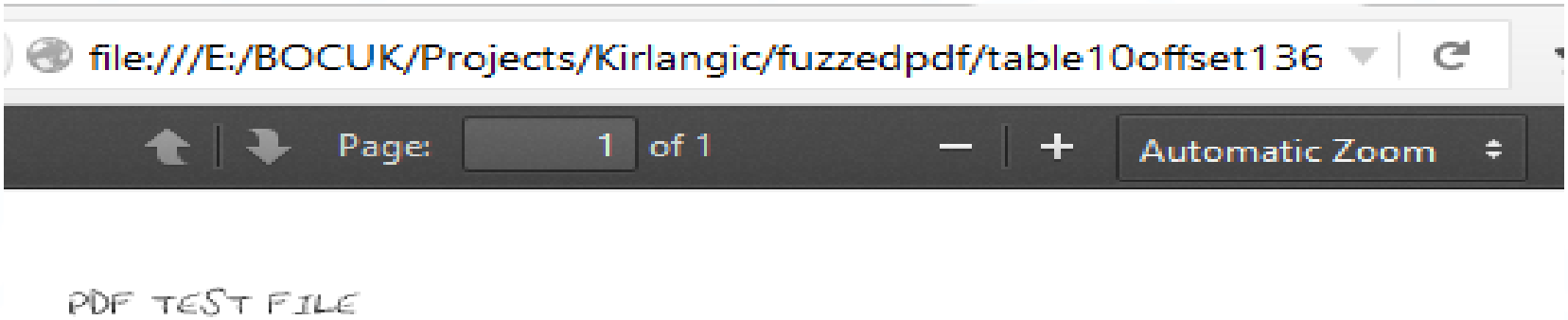
- We can use some modules to generate PDF testcases
  - **fpdf** module to create PDF files in a few line
  - Here you can see how we generate a pdf, add our fuzzed TTF into it, create a blank page and fill it with some data

```
def createPDF(tFile):
    #Set fuzzed pdf name
    sPfile = tFile.split(".ttf")[0]
    tempPDF = FPDF()
    #Add our fuzzed ttf into PDF
    try: tempPDF.add_font(sPfile, "", args.o + "/" + tFile, uni=True)
    except: return
    tempPDF.set_font(sPfile, "", 16)

    #Create blank page and fill it with data
    tempPDF.add_page()
    tempPDF.cell(40, 10, "PDF TEST FILE")

    #Create fuzzed PDF
    try: tempPDF.output(args.op + sPfile + ".pdf", "F")
    except: return

    tempPDF.close()
```

** Need to do a simple modification on FPDF core as it doesn't embed some corrupted fonts

Generating PDF

- Result:



https://pypi.python.org/pypi/fpdf

Generating Java Application

- We have 2 file to generate a Java application

1. **FuzzJava.java**

   Our example java code. It uses **loadFont** to add our fuzzed TTF file into the application and use it with *Vbox->setStyle*.

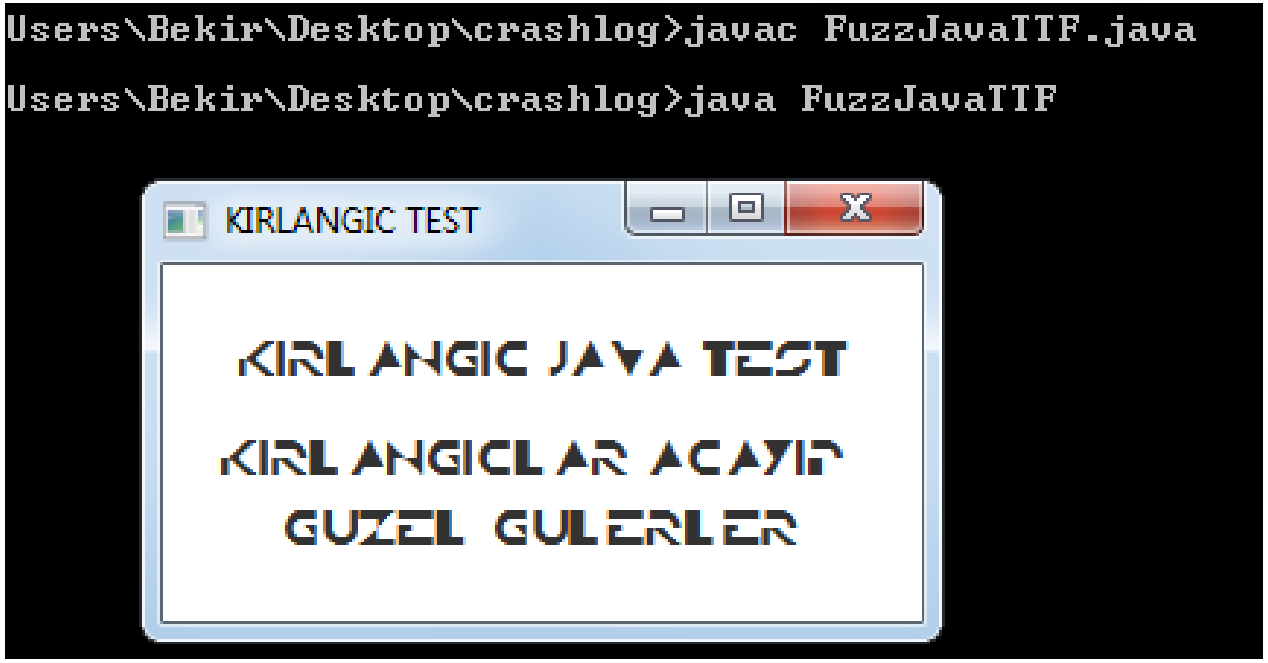
```
Font.loadFont(
  FuzzJavaTTF.class.getResource("Dexter.ttf").toExternalForm(),
  10
);

Label caption = new Label("kirlangiclar acayip guzel gulerler");
caption.getStyleClass().add("caption");
..
..
VBox layout = new VBox(10);
layout.setStyle("-fx-padding: 20px; -fx-font-family: Dexter; -fx-background-color: white");
..
..
final Scene scene = new Scene(layout);
stage.setScene(scene);
stage.show();
```

2. FuzzJava.py

Briefly it opens FuzzJava.java and update its content to change current used font to our fuzzed font. And finally compile it with java compiler.

```
casename = fuzzedTTf.split(".")[0]
newttf  =  "/fuzzedttf/" + fuzzedTTf
newdata = filedata.replace("dexter.ttf", newttf)
newdata = newdata.replace("FuzzJavaTTF", casename)
filename = "fuzzedjava/" + casename + ".java"
f = open(filename, 'w')
f.write(newdata)
f.close()
os.system("javac " + filename )
```

- Result:


Users\Bekir\Desktop\crashlog>javac FuzzJavaTTF.java
Users\Bekir\Desktop\crashlog>java FuzzJavaTTF
KIRLANGIC TEST
KIRLANGIC JAVA TEST
KIRLANGICLAR ACAYIP
GUZEL GULERLER

Generating Silverlight Application

for (i=0, i<ttf-amount, i++) {

- Embed mutated TTFs to VS Silverlight Project
- Build the project with «MSBuild»
- Generate HTML files to call builded «XAP» silverlight applications

}

Generating Silverlight Application

```
def MainPageXaml(fontFileName, fontFamilyName):
    with open("SilverlightApplication1\Master.xaml", 'r+') as rFile:
        readData = rFile.read()

        readData = readData.replace("""FontFamily="dexter.ttf#DexterC\"""",
                                    """FontFamily="%s#%s\"""" % (fontFileName, fontFamilyName))
        with open("SilverlightApplication1\MainPage.xaml", 'w') as wFile:
            wFile.write(readData)
            wFile.close()

def CSProj(fileName):
    document = ET.parse('SilverlightApplication1\SilverlightApplication1.csproj')
    root = document.getroot()
    ET.register_namespace('',"http://schemas.microsoft.com/developer/msbuild/2003")

    for i in root.getchildren():
        for z in i.getchildren():
            if z.tag == '{http://schemas.microsoft.com/developer/msbuild/2003}Resource':
                z.attrib['Include'] = str(fileName)
                document.write('SilverlightApplication1\SilverlightApplication1.csproj')

def MSBuild():
    os.system("MSBuild.exe SilverlightApplication1.sln /p:Configuration=Release")
```

Fuzzing Results

- No fuzzing farm! We performed fuzzing on our personal computers (4-6gb ram, i7 1.90 ghz etc.)

Fuzzing Results

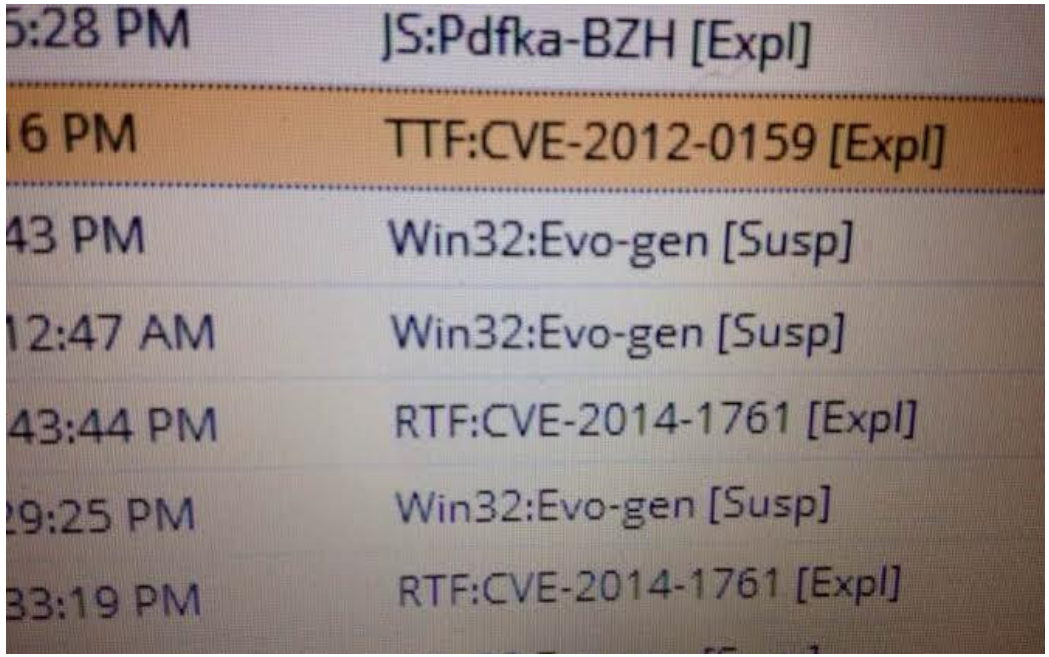
- Part-time fuzzing in our spare time (total fuzzing time = less than 48 hours)

Fuzzing Results

- A few small TTF samples for testing
- Targeted MS Office 2013 & Oracle Java
- Total fuzzing test case ~= 40.000

Fuzzing Results

- Disable your antivirus during fuzzing
- It can re-discover some old vulnerabilities ☺



5:28 PM	JS:Pdfka-BZH [Expl]
6 PM	TTF:CVE-2012-0159 [Expl]
43 PM	Win32:Evo-gen [Susp]
12:47 AM	Win32:Evo-gen [Susp]
43:44 PM	RTF:CVE-2014-1761 [Expl]
29:25 PM	Win32:Evo-gen [Susp]
33:19 PM	RTF:CVE-2014-1761 [Expl]

Fuzzing Results

- 4 bugs in Office 2013:
  - Two of them looks exploitable.
  - One of them has been reported to the vendor through ZDI, waiting for patch (ZDI-CAN-3102)
  - Heap corruption through MSO.DLL
- 2 bugs in Java

- POC#1 – MS Office 2013

Command - Pid 2836 - WinDbg:6.12.0002.633 X86

```
EXCEPTION_PARAMETER1:  00000001

EXCEPTION_PARAMETER2:  34f84000

WRITE_ADDRESS:  34f84000

FOLLOWUP_IP:
mso!Ordinal4035+1574
645b2c15 66890c16        mov     word ptr [esi+edx],cx

MOD_LIST: <ANALYSIS/>

BUGCHECK_STR:  APPLICATION_FAULT_INVALID_POINTER_WRITE_WRONG_SYMBOLS_EXPLOITABLE

PRIMARY_PROBLEM_CLASS:  INVALID_POINTER_WRITE_EXPLOITABLE

DEFAULT_BUCKET_ID:  INVALID_POINTER_WRITE_EXPLOITABLE

LAST_CONTROL_TRANSFER:  from 645b3110 to 645b2c15
```

- POC#2 – MS Office 2013

Command - Pid 3404 - WinDbg:6.12.0002.633 X86

```
FOLLOWUP_IP:
mso!Ordinal3847+38e
637c2b1e 8a0a            mov     cl,byte ptr [edx]

MOD_LIST: <ANALYSIS/>

BUGCHECK_STR:  APPLICATION_FAULT_INVALID_POINTER_READ_WRONG_SYMBOLS_PROBABLYEXPLOIT

PRIMARY_PROBLEM_CLASS:  INVALID_POINTER_READ_PROBABLYEXPLOITABLE

DEFAULT_BUCKET_ID:  INVALID_POINTER_READ_PROBABLYEXPLOITABLE

LAST_CONTROL_TRANSFER:  from 63894d7b to 637c2b1e
```

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Questions?

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