

# Supporting old proprietary graphic formats

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# What is a WMF?

## Windows Metafile

- Graphic format that supports vector and raster graphics
- Introduced in early 1990s (in comparison, SVG was released in 2001)
- Composed of a set of GDI drawing commands and structures
- These drawing commands are played back sequentially to render the graphic within what is known as the playback device context
- Not as widely supported as SVGs



# What are the difficulties in supporting this format?

- WMF files are application and device dependent<sup>1</sup>
- The device context associated with a WMF file cannot be queried (that is, an application cannot retrieve device-resolution data, font metrics, and so on).
- There's a format specification, but there's a lot of edge cases with undefined behavior
- Pinpointing the root cause of a buggy file is tricky

**How do you debug a WMF?**



# Getting the drawing commands

## Multiple ways of doing so:

- mso-dumper, created and used by LibreOffice developers
- MetafileExplorer<sup>1</sup>, allows for viewing and stepping through the drawing commands
- The EnumMetaFile GDI function, which allows to enumerate the drawing commands in a WMF and call a callback function



# Example of an EMF drawing command

GDI function signature:

```
BOOL ExtTextOutW(  
    [in] HDC          hdc,  
    [in] int          x,  
    [in] int          y,  
    [in] UINT         options,  
    [in] const RECT  *lprect,  
    [in] LPCWSTR      lpString,  
    [in] UINT         c,  
    [in] const INT   *lpDx  
);
```

Record within EMF:

```
EMR_EXTTEXTOUTW  
  ... RECTL rclBounds: {0, 0, 68, 15}  
  ... DWORD iGraphicsMode: GM_COMPATIBLE  
  ... FLOAT exScale: 16.6667  
  ... FLOAT eyScale: 24.7678  
  EMRTEXT emrtext  
    ... POINTL ptlReference: {0, 0}  
    ... DWORD nChars: 10  
    ... DWORD offString: 76  
    ... DWORD fOptions: 0  
    ... RECTL rcl: {0, 0, -1, -1}  
    ... DWORD offDx: 96  
    ... [76] L"Some text!"
```



# Debugging

- Compare with other WMF reader implementations
- Identify which drawing command(s) cause the bug
- Reduce the irrelevant commands as much as possible (simplify the problematic file)
- Work around the buggy commands to find what is wrong



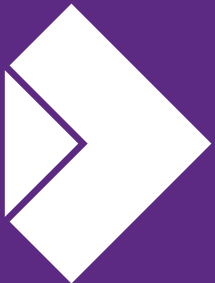
# Making sure you didn't break something

- Create a unit test for your fix using a minimally reproducible example
- Run the appropriate test suites
- Confirm that roundtripping works as expected





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**Thank you!**

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