

# Analyzing Malicious Documents - v1.0

## Office Files Versions

Office 97-2003 documents use OLE (object linking and embedding) compound binary file format.

These files have a signature of 0xD0CF11E0A1B11AE1, which appears as "DOCFILE".

These files are still compatible with the latest versions of Office.

OLE file format was replaced in Office 2007 with Office Open XML (OOXML).

OOXML is a ZIP archive that uses XML-based files to represent document structure.

Macros are stored inside OLE2 files and in *vbaProject.bin* in OOXML.

OneNote files can not contain macros without 3<sup>rd</sup> party extensions. Often contain embedded objects, such as scripts and executables.

PDF files can contain JavaScript to execute code.

RTF documents do not contain macros but can be opened by Word and may be used in exploitation.

## Common File Types & Extensions

Word 97-2003                    .doc, .dot

Word (OOXML)                  .docm, .docx, .dotm, .dotx, .rtf

Excel 97-2003                .xls, .xlt, .xlm

Excel (OOXML)                .xlsx, .xlsm, .xltx, .xltm

PowerPoint 97-2003            .ppt, .pot, .pps, .ppa

PowerPoint (OOXML)            .pptx, .pptm, .potx, .potm, .ppam, .ppsx, .ppsm, .sldx, .sldm, .ppam

OneNote                        .one

Publisher                      .pub

Portable Document Format (PDF)            .pdf

## oledump Use Cases

Python tool designed by Didier Stevens to analyze OLE (Compound Binary Files). Primary file types are Microsoft Office.

Basic usage:  
`oledump.py [options] file`

First command to run on new sample:

`oledump maldoc.docm`

A: wordvbaProject.bin

A1:	487	'PROJECT'
A2:	71	'PROJECTtwn'
A3:	M 1053	'VBA/NewMacros'
A4:	M 6073	'VBA/ThisDocument'
A5:	3667	'VBA/_VBA_PROJECT'
A6:	1089	'VBA/__SRP_0'
A7:	70	'VBA/__SRP_1'
A8:	84	'VBA/__SRP_2'
A9:	103	'VBA/__SRP_3'
A10:	575	'VBA/dir'

*vbaProject.bin* indicates OOXML document with macro code.

First column A# indicates the stream number, this value can vary in format.

Second column indicates stream type. Uppercase M indicates a macro stream with macro content. These are typically the most interesting.

m (Lowercase) indicates a macro stream without macro content. This are often found with documents that contain forms.

Other indicator types include:

- E: corrupt
- !: unusual VBA code
- O: embedded object
- :: storage
- R: root entry

Third column represents stream size.

Fourth column represents stream name.

To inspect macros, use the `-s` argument to identify stream number and `-v` to decompress macro stream:

`oledump -s A3 -v maldoc.docm`

This will dump macro content to the terminal, consider redirecting with `>` to a file for further inspection.

Use *a* as the stream index to dump all macro streams.

Use Yara rules to scan a document:

`oledump -y yara.rule maldoc.docm`

Output will show if Yara rule matched the VBA code.

To use a plugin, use the `-p` argument.

`Oledump -p plugin_vba_summary maldoc.docm`

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## olevba Use Cases

Script to parse OLE and OOXML files to extract and analyze VBA code. Also supports XLM/Excel 4 macros.

```
olevba [options] file file2 ...
```

First command to run on a sample:

```
olevba file
```

Output will include macro code and a summary table w/ helpful indicators.

Summary table will include *Type*, *Keyword* and *Description*.

Indicators will be highlighted in macro code above summary table; this helps identify suspicious code segments.

If obfuscated strings are suspected, try `--decode`. For obscured code, try `--reveal`.

## Excel 4.0 / XLM

Introduced in 1992 by Microsoft, were disabled by default in 2022 after an uptick in abuse.

Macros are embedded in an Excel sheet, do not use VBA. Require different tools to analyze.

`oledump` provides the plugin `plugin_biff` for analyzing XLM macros.

`XLMMacroDeobfuscator` is another purpose-built tool and includes macro emulation.

## oledump PLUGIN\_BIFF Use Cases

To view sheet visibility and name:

```
oledump --p plugin_biff -ppluginoptions "-x" maldoc.xls
```

## XLMMacroDeobfuscator Use Cases

First command to run on a sample:

```
XLMdeobfuscator -f maldoc.xls
```

Output includes entry point worksheet/cell and emulated code.

## onedump Use Cases

Dump tool for OneNote files.  
`onedump [options] file`

First command to run on a sample:

```
onedump malware.one
```

```
le: malware.one
1: 0x00002530 powe ...
2: 0x00003490 .PNG ...
3: 0x00003840 .PNG ...
4: 0x0000f148 .Set ...
```

The first column represents the index. The second column the beginning of the stream content. This is often the most interesting column. The remaining columns provide stream information.

In this example, streams 1 and 4 are the most interesting. Stream 1 appears to be PowerShell while stream 4 a batch script.

To extract content from a stream, use the `-d` argument w/ the stream index.

```
oledump -s 1 -d malware.one
```

## PDFID & PDF-Parser Use Cases

PDFID is a tool to test a PDF file.

PDFParser is a tool to parse PDF files.

First command to run:

```
pdfid.py file
```

Look for evidence of JavaScript in /JS or /JavaScript. Then use `pdf-parser.py`.

Inspect objects:

```
pdf-parser.py file
```

Index for object will be displayed, can use with `-o` argument. Look for command execution and other suspicious behavior.

## Suspicious PDF Strings

/JavaScript, /JS, /AcroForm, /XFA      JavaScript code

/OpenAction, /AA      Auto-execution

/URI      Resource access by URI

/ObjStm      Object stream

## oledump Commands

Python tool designed by Didier Stevens to analyze OLE (Compound Binary Files).

```
oledump.py [options] file
```

<code>-m, -h</code>	Usage information
<code>--version</code>	Version number
<code>-m</code>	Print manual
<code>-s [NUMBER]</code>	Select item NUMBER for dumping
<code>-d</code>	Perform dump
<code>-x</code>	Performs hex dump
<code>-a</code>	Performs ASCII dump
<code>-A</code>	ASCII dump w/ RLE
<code>-S</code>	String dump
<code>-T</code>	Head & Tail
<code>-v</code>	VBA decompression
<code>-r</code>	Read raw file (use with <code>-v</code> or <code>-p</code> )
<code>-t ENCODING</code>	String translation, ENCODING is utf16, etc
<code>-e</code>	Extract OLE embedded files
<code>-i</code>	Print extra info
<code>-p PLUGIN</code>	Loads PLUGIN
<code>--pluginoptions</code>	Options for the loaded plugin
<code>-q</code>	Only print output from plugins
<code>-y YARA</code>	YARA rule file or directory
<code>-D DECODER</code>	Decoders to load
<code>-M</code>	Print metadata
<code>-V</code>	Verbose output
<code>-C CUT</code>	Cut data
<code>-c</code>	Extra data such as hashes
<code>--password=</code>	Password to use on input file
<code>-j</code>	JSON output

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## olevba Commands

Script to parse OLE and OOXML files to extract and analyze VBA code. Also supports XML/Excel 4 macros.

*olevba [options] file file2 ...*

**-h** Usage information

**-r** Finds files recursively

**-z** ZIP password

**-a** Display only analysis, not source code

**-c** Display on VBA source code

**--decode** Attempt to deobfuscate encoded strings

**--reveal** Show VBA source code with deobfuscated string content

**--deobf** Attempt to deobfuscate VBA expressions

**--show-pcode** Show disassembled P-code

**-t** Triage mode, display summary table only

**-d** Detailed report

## PDFID Commands

PDFID is a tool to test a PDF file.

*pdfid.py [options] file*

**--version** Version number

**-h** Help

**-s** Scan given directory

**-a** Display all names

**-f** Force scan

**-d** Disable JavaScript and auto launch

**-p PLUGIN** Load PLUGIN

**-v** Verbose mode

**-S SELECT** Select expression

## onedump Commands

**-h** Help

**-o** Output to file

**-s #** Select item by #

**-d** Dump

**-x** Hexdump

## Misc. Tools & Purpose

Remove password from protected VBA project:

*evilclippy -uu file*

Extract objects embedded in an RTF file:

*rtfobj.py malware.rtf*

Inspect contents of OOXML file (ZIP):

*zipdump.py file*

Extract stream with index from file:

*zipdump.py -s 2 -d file*

Pretty-print XML from STDIN, consider using | redirection:

*xmldump.py pretty*

ViperMonkey is a VBA emulation tool.

*vmonkey file*

**msoffcrypto-tool** is used to decrypt/encrypt office files. Will prompt for password, otherwise define password with **-p** argument.

*msofficecrypto-tool encrypted decrypted*

## PDF-Parser Commands

*pdf-parser.py [options] file*

**-s** String to search

**-r REFERENCE** ID of indirect object being referenced

**-e ELEMENTS** Type of elements to select

**-o OBJECT** ID(s) of indirect object being referenced

## XLMMacroDeobfuscator Commands

*XLmdeobfuscator -f FILE [options]*

**-h** Help

**-f** File path

**-x** Extract cells only without emulation

**--start-point** Start interpretation from a specific cell

**-p** Password for file

**--timeout N** Emulation timeout in seconds