Formatting for Justice

crime doesn't pay, neither does rich text

Anthony Kasza

Botconf 2017

I am rich text.

I am plain text.

The End

Outline

File format

Common obfuscation

Generators and Analysis tools

Signature writing

Experiments

Extra credit

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RTF File Format

Used to format text

RIP RTF: 1987-2008

"Wrapper" capabilities

ASCII based

Nestable "tags"

Whitespace agnostic

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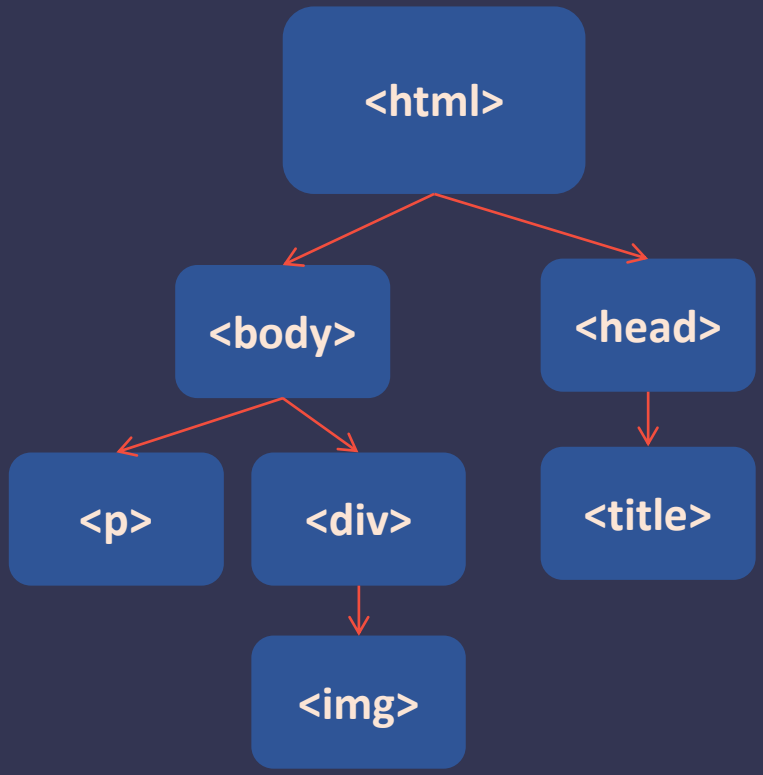
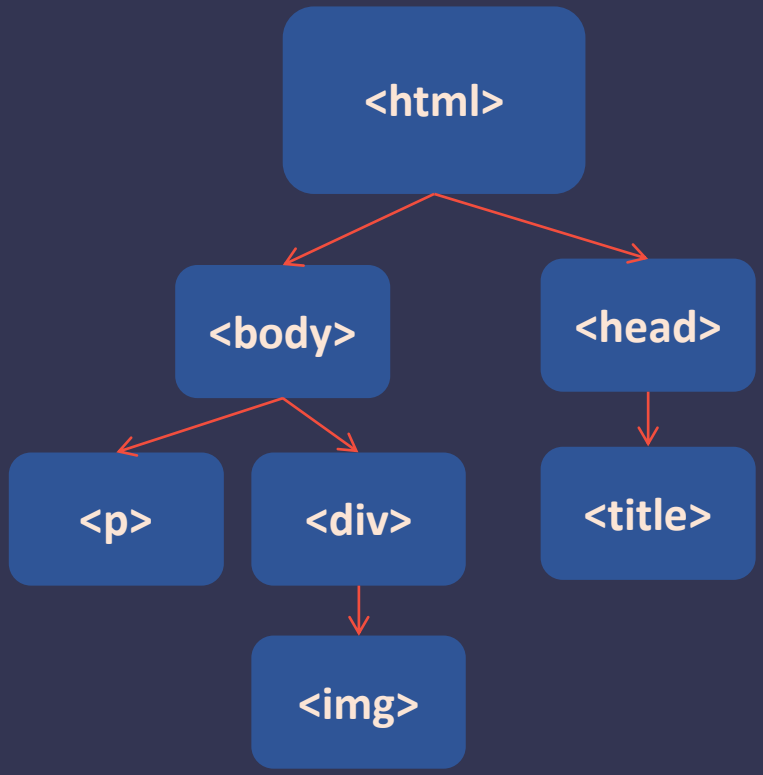
Similar to HTML

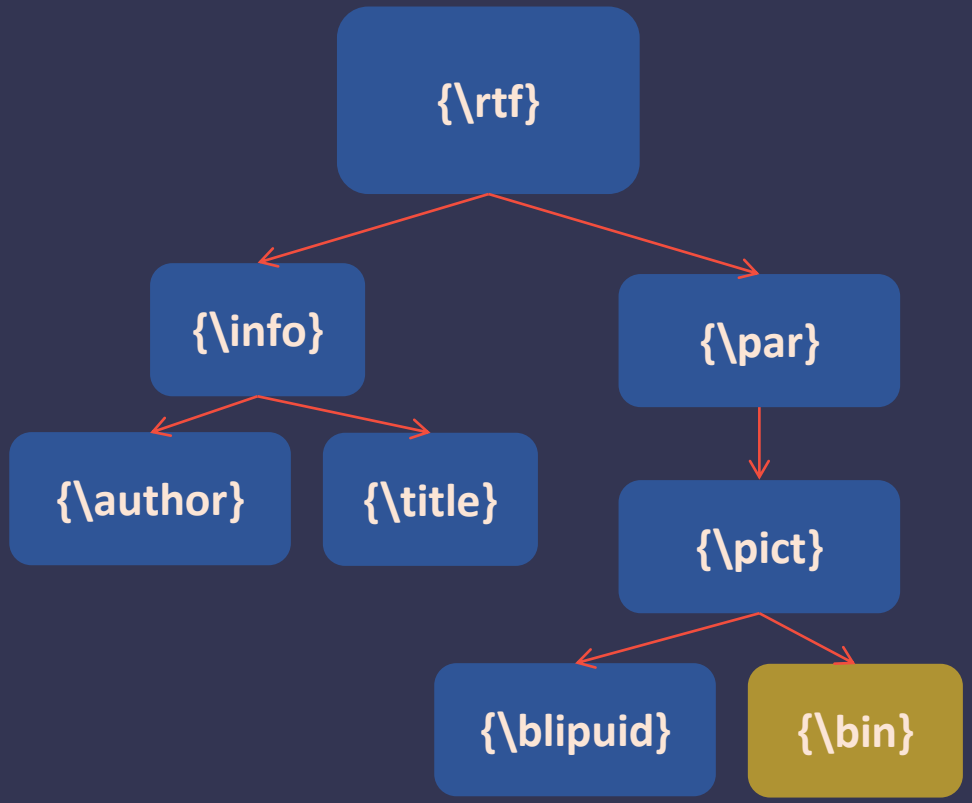
RTF File Format



RTF File Format



HTML tags



RTF Entities

RTF File Format: Entities

Groups

Text/Data

Control Words

Control Symbols

```
{\rtf
    {\info
        {\author AK}
        {\company PANW}
    }
    This is some text
    {\i This is some italic text}
    This is some hex \'b7
    {\*\AK}
}
```

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Common Obfuscation

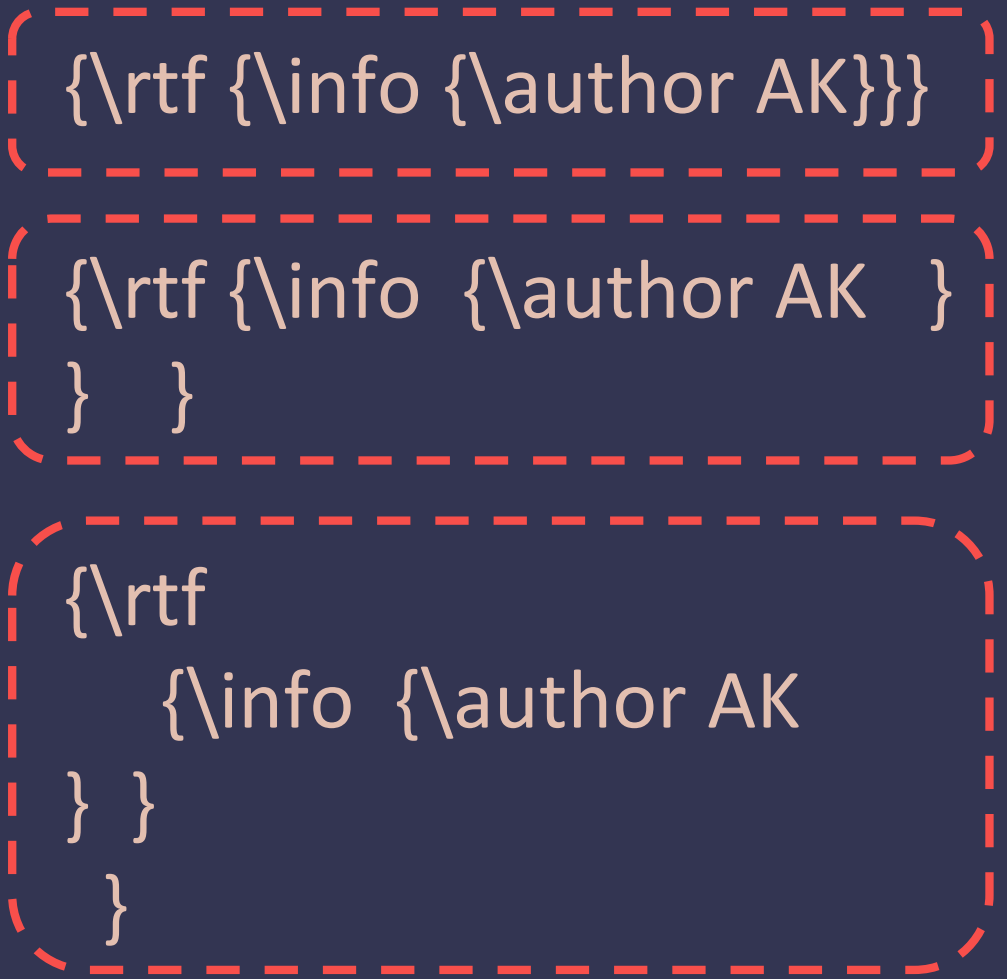
Whitespace

Headers

Nesting

Default ignore

File Extensions



Common Obfuscation

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File Extensions

{\rt AK}

{\rtf1 AK}

{\rtf1xzgen AK}

{\rtfXXX AK}

Common Obfuscation

Whitespace

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Nesting

Default ignore

File Extensions

{\rtf {\info}}

{\rtf {{{\info}}} }

Common Obfuscation

Whitespace

Headers

Nesting

Default ignore

File Extensions

```
Ca{\*\Meow ffff}t
```

```
H
E{\mmmailsubject
GOODBYE}L
L{\mmmailsubject}
O
```

Common Obfuscation

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File Extensions

Renaming RTF files with a DOC extension forces the file to be opened with MS Word

Often used with OLE exploit RTFs

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Generators: Legitimate

Additional material shared at conference

Generators: Malicious

```
def generate_exploit_rtf():
    # Preparing malicious RTF
    s = docuri
    docuri_hex = "00".join("{:02x}".format(ord(c)) for c in s)
    docuri_pad_len = 224 - len(docuri_hex)
    docuri_pad = "0"*docuri_pad_len
    uri_hex = "010000020900000001000000000000000000000000000a4000000e0c9ea79f9bace118c8200aa004ba90b8c000000"+docuri_hex+docuri_pad+"000

    payload = "{\\rtf1\\adeflang1025\\ansi\\ansicpg1252\\uc1\\adeff31507\\deff0\\stshfdbch31505\\stshfloch31506\\stshfhich31506\\stshfbi315
    payload += "{\\info\n"
    payload += "{\\author }\n"
    payload += "{\\operator }\n"
    payload += "}\n"
    payload += "{\\*\\xmlnstbl {\\xmlns1 http://schemas.microsoft.com/office/word/2003/wordml}}\n"
    payload += "{\n"
    payload += "{\\object\\objautlink\\objupdate\\rsltpict\\objw291\\objh230\\objscalex99\\objscaley101\n"
    payload += "{\\*\\objclass Word.Document.8}\n"
    payload += "{\\*\\objdata 0105000002000000\n"
    payload += "090000004f4c45324c696e6b0000000000000000000a0000\n"
    payload += "d0cf11e0a1b11ae1000000000000000000000000000003e000300feff090006000000000000000000000100000001000000000000000100000020
    payload += "ffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffffff
```

Generators: Malicious

2017-0199 builder
wingd/stone/ooo
VT testing
Sofacy
Monsoon
MWI

Ancalog
AK builder

Released a few days after the CVE gained media attention

Appends RTF “chunks” together to create a weaponized file

[10]

Generators: Malicious

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Generators: Malicious

2017-0199 builder	2014-1761, 2013-3906, 2012-0158, 2010-3333, 2017-0199, 2016-4117
wingd/stone/ooo	
VT testing	
Sofacy	Commodity
Monsoon	
MWI	PHP scripts
Ancalog	Supports file types beyond RTF
AK builder	[7] [8] [9]

Generators: Malicious

2017-0199 builder
wingd/stone/ooo
VT testing
Sofacy
Monsoon
MWI

Ancalog [14] [15]
AK builder [11] [12] [13] [21]

Analysis Tools

rtfdump - analyze RTF groups and objects

rtfobj -dump objects from RTFs, part of oletools

pyRTF/pyrtf-ng - generate RTFs from python

Yara - find builders/kits with entity reuse

CRITs, LaikaBoss, other pipelines [16] [17]

Write your own!

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Signature Writing: Control Words

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Signature Writing: Metadata

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Tangent

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Experiments: Control Word Ratios

1. Gathered mal and benign sample set
2. Counted control words in each sample
3. Calculated a score of maliciousness for control words in RTF

Most Popular Mal:
\object
\objocx
\objclass
\objw
\objemb

Most Popular Benign:
\blue
\green
\colortbl
\cf
\ansi

Experiments

Additional material shared at conference

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RTF file on Google Drive

Simple challenge to learn RSIDs in RTFs

Locate the hidden flag

Additional material shared at conference

Special Thanks

Botconf

You all

References

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The End