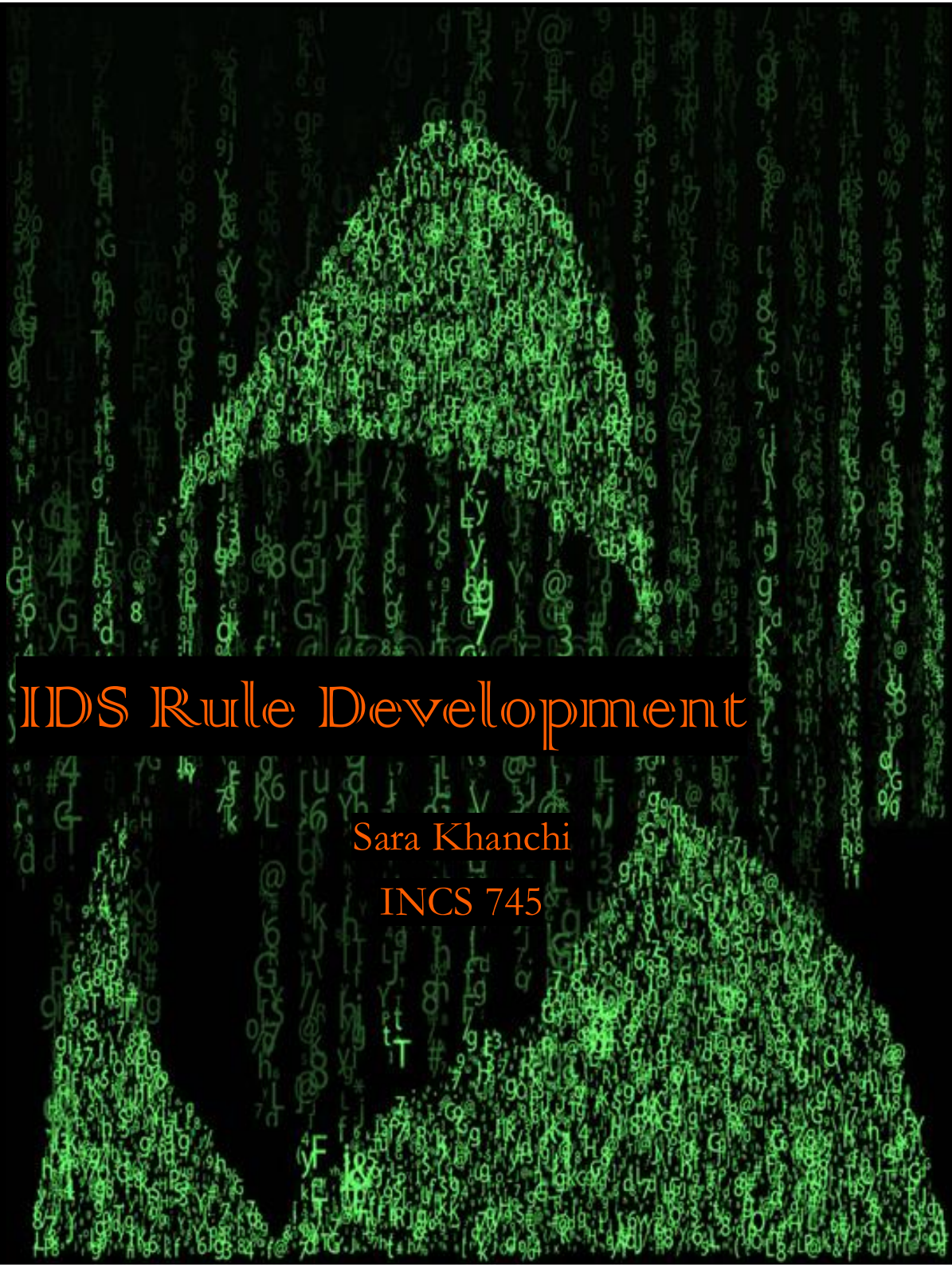


IDS Rule Development

Sara Khanchi

INCS 745

What is the point of this?

Introduction to IDS rule language

Be comfortable interpreting IDS rules

Feel empowered to write IDS rules

Be knowledgeable on detecting threats on the network

Network Analysis Basics

Network Traffic Analysis

A basic understanding of TCP/IP

Not enough time to dig into low-level stuff here

We can talk about some tools

Basic network traffic analysis techniques

Wireshark

- The best tool out there for graphical packet analysis
- Views & Column Layout
- Wireshark -> Preferences
- Arrange and edit columns for viewing packet data
  - Ability to add custom fields by clicking “+” and entering a filter (e.g http.response.code)
  - Arrange packet data layout for ease of analysis under "Layout" and chose a configuration

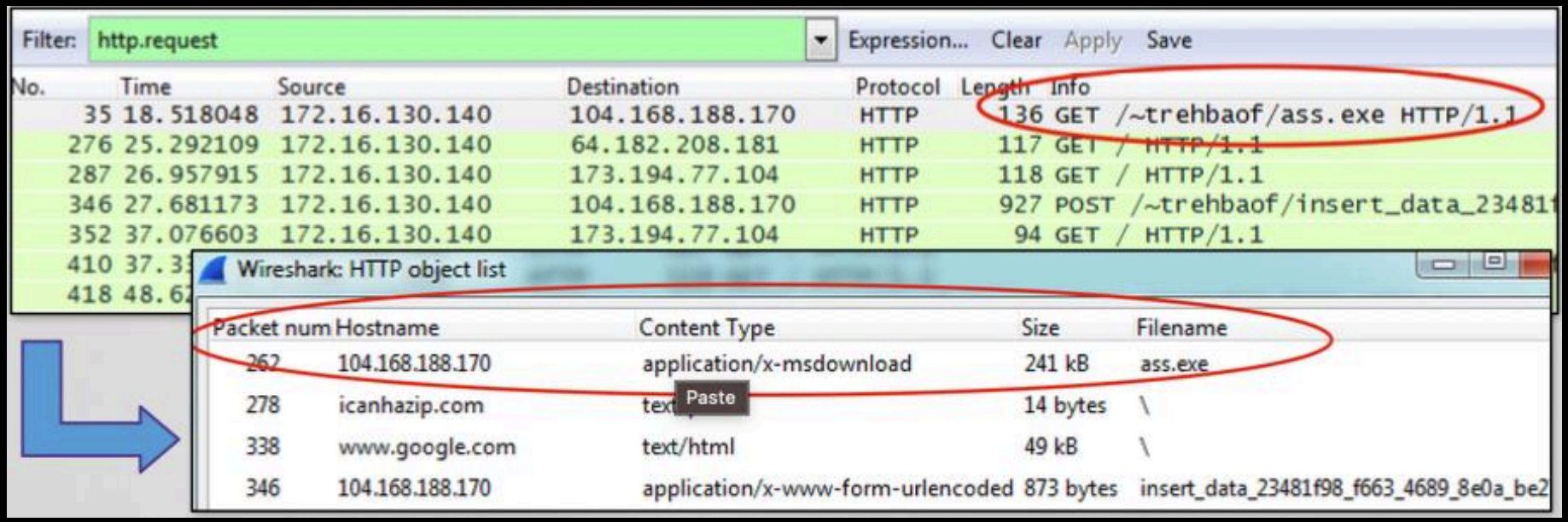
Wireshark - File Extraction (1)

Built in ability to parse PCAP for known HTTP, SMB/2, DICOM and TFTP objects (File -> Export Objects)

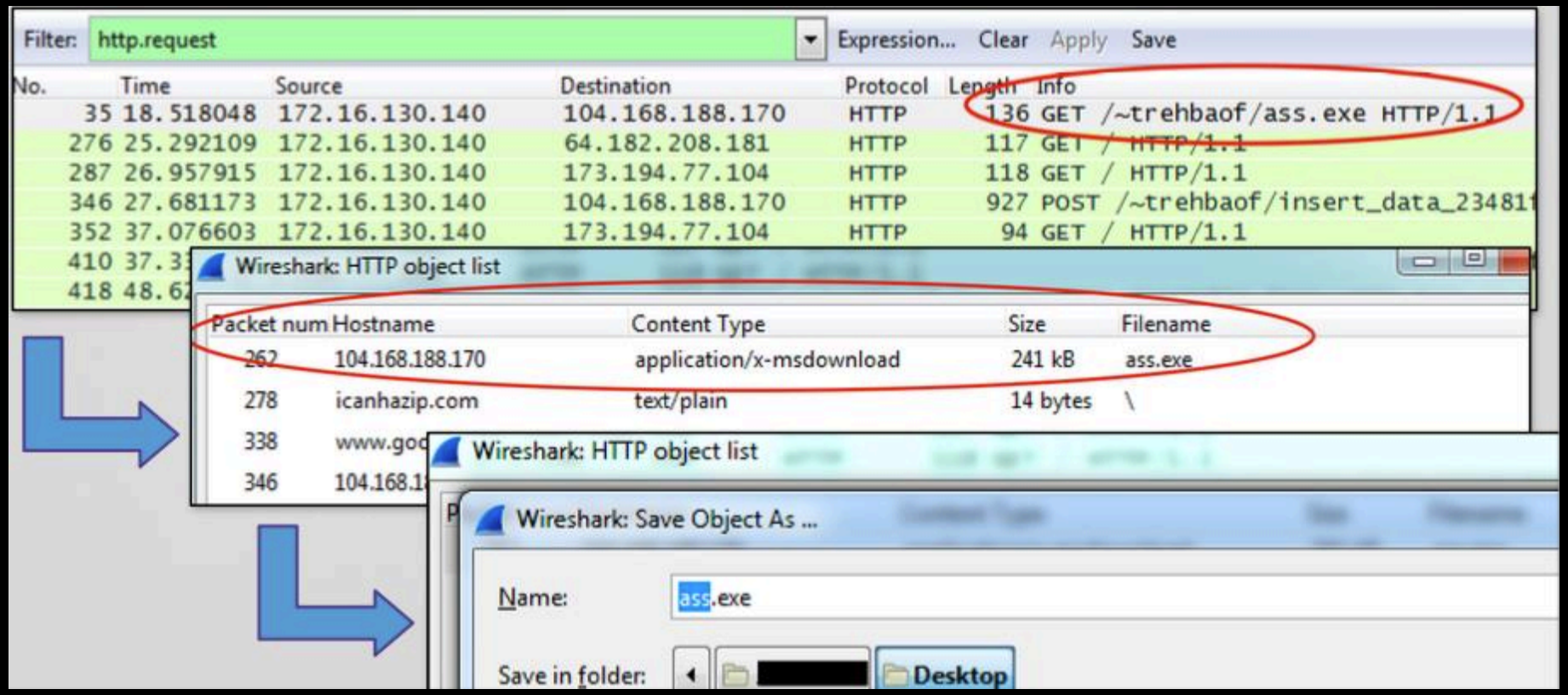
Filter: http.request | Expression... | Clear | Apply | Save

No.	Time	Source	Destination	Protocol	Length	Info
35	18.518048	172.16.130.140	104.168.188.170	HTTP	136	GET /~trehbaof/ass.exe HTTP/1.1
276	25.292109	172.16.130.140	64.182.208.181	HTTP	117	GET / HTTP/1.1
287	26.957915	172.16.130.140	173.194.77.104	HTTP	118	GET / HTTP/1.1
346	27.681173	172.16.130.140	104.168.188.170	HTTP	927	POST /~trehbaof/insert_data_23481
352	37.076603	172.16.130.140	173.194.77.104	HTTP	94	GET / HTTP/1.1
410	37.331126	172.16.130.140	104.168.188.170	HTTP	357	POST /~trehbaof/update_data_23481
418	48.626913	172.16.130.140	173.194.77.104	HTTP	94	GET / HTTP/1.1

Wireshark - File Extraction (2)



Wireshark - File Extraction (3)

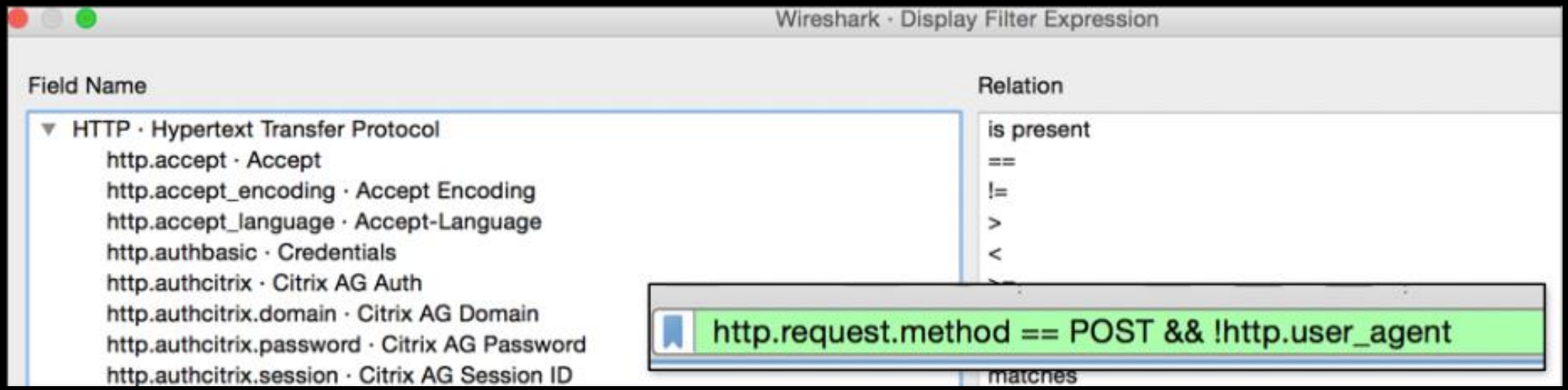


Wireshark - Following Streams

- Ability to assemble TCP/HTTP streams to view session data
- Default view is ASCII, can change to Hex (useful) and other encodings
- Right click packet of interest -> Follow -> TCP (HTTP) Stream

Wireshark - Filters

- Filters are entered in the top bar and are limited to specific search parameters
- Can use qualifiers like &&, !=, ==, ||, <=, =>



Why IDS/IPS

- Still an extremely valuable tool in your arsenal
- Applicable when discussing defense in depth
- Not perfect
- Provide context
- What can full PCAP provide?

IDS Rule Theory

- Generally, we want agile but effective rules
  - Don't be like generic AV names and hash-based detections
- Specific enough to capture desired traffic without False Negatives
- Loose enough to capture variants without False Positives
- Balance!
- Won’t always work this way!

IDS Landscape

- **Suricata** (https://suricata-ids.org/)
  - Open-source, community driven
  - Multi-threaded for fast performance
  - Robust protocol identification (can parse HTTP on off-ports, etc)
  - More than just IDS - NSM! Lua! File Extraction!

- Snort (https://snort.org/)
  - Most influential IDS developed
  - Open-source
  - Developed/maintained by Sourcefire, now part of Cisco/Talos

- http://suricata.readthedocs.io/en/latest/rules/differences-from-snort.html

What is an IDS rule?

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=sdJoFsAv3jSNMEYxHTTP/1.1 200 OK
Date: Sat, 13 Aug 2016 04:45:30 GMT
Server: Apache
X-Powered-By: PHP/5.2.17
Content-Length: 186
Connection: close
Content-Type: text/html

MQoxjmeGRPHGh2GVdFSPHnycHwL5i7Z4
<!-- Hosting24 Analytics Code -->
<script type="text/javascript" src="http://stats.hosting24.com/count.php"></script>
<!-- End Of Analytics Code -->
```

What is an IDS rule?

Suricata

```
alert http $HOME_NET any -> $EXTERNAL_NET any (msg:"DetoxCrypto
Ransomware CnC Activity"; flow:established,to_server; content:"POST";
http_method; content:"/ generate.php"; http_uri; content:"DetoxCrypto";
fast_pattern; http_user_agent; content:"publickey="; depth:10; http_client_body;
content:!"Referer|3a|"; http_header; pcre:"/\.php$/U";
reference:md5,e273508a2f2ed45c20a2412f7d62eceb; classtype:trojan- activity;
sid:1000000001; rev:1;)
```

Snort

```
alert tcp $HOME_NET any -> $EXTERNAL_NET $HTTP_PORTS
(msg:"ETPRO TROJAN DetoxCrypto Ransomware CnC Activity";
flow:established,to_server; content:"POST"; http_method;
content:"/generate.php"; http_uri; content:"User-Agent|3a 20|DetoxCrypto";
fast_pattern:3,20; http_header; content:"publickey="; depth:10; http_client_body;
content:!"Referer|3a|"; http_header; pcre:"/\.php$/U";
reference:md5,e273508a2f2ed45c20a2412f7d62eceb; sid:10000000001; rev:1;)
```

Rule Foundations

IDS Rule Basic Format

```
action protocol from_ip port -> to_ip port

(msg:"something"; content:"something";

content:"something else"; sid:10000000; rev:1;)
```

IDS Rule Basic Format

```
action protocol from_ip port -> to_ip port

(msg:"something"; content:"something";

content:"something else"; sid:10000000; rev:1;)
```

IDS Rule Basic Format

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IDS Rule Basic Format

action protocol from_ip port -> to_ip port

(msg:"something"; content:"something";

content:"something else"; sid:10000000; rev:1;)

Rule Action

Tells the IDS engine what to do when traffic matches this rule

- alert
  - Generate alert, and log matching packets, but let the traffic through
- log
  - Log traffic– no alert
- pass
  - Ignore the packet, allow it through
- drop
  - If IPS mode, sensor should drop the offending packet
- reject
  - IDS will send TCP reset packet

Rule Action

Tells the IDS engine what to do when traffic matches this rule

- alert
  - Generate alert, and log matching packets, but let the traffic through

Action protocol from_ip port -> to_ip port (msg:"something";

content:"something"; content:"something else"; sid:10000000; rev:1;)

- drop
  - If IPS mode, sensor should drop the offending packet
- Reject
  - IDS will send TCP reset packet

Rule Protocol

- Suricata and Snort have the ability to detect specific protocols declared by the rule writer
- tcp
- udp
- icmp
- ip
- http (Suricata only)
- tls (Suricata only)

Rule Protocol

- Suricata and Snort have the ability to detect specific protocols declared by the rule writer
- tcp

```
action protocol from_ip port -> to_ip port (msg:"something";
content:"something"; content:"something else"; sid:10000000; rev:1;)
```

- http (Suricata only)
- tls (Suricata only)

Rule Hosts Variables

- This is how you declare who is sending traffic to who
- Configurable via suricata.yaml and snort.conf
  - Contains defaults, but double check them
- $HOME_NET
  - Refers to internal networks, specified in the conf/yaml
- $EXTERNAL_NET
  - Not $HOME_NET, or what you choose in conf/yaml
- $HTTP_SERVERS, $SMTP_SERVERS, etc...
- Single IP

Rule Hosts Variables

- This is how you declare who is sending traffic to who
- Configurable via suricata.yaml and snort.conf
  - Contains defaults, but double check them

action protocol **from_ip** port -> **to_ip** port (msg:"something";

content:"something"; content:"something else"; sid:10000000; rev:1;)

- Single IP

Rule Direction

- Simply stated by an arrow: ->
- This tells the engine what direction traffic is flowing between hosts
- Traffic from internal host -> outbound
  - $HOME_NET any -> $EXTERNAL_NET any
- Traffic from external host -> inbound
  - $EXTERNAL_NET -> $HOME_NET any
- Can be bidirectional by using: <>
  - $EXTERNAL_NET any <> $HOME_NET any

Rule Direction

- Simply stated by an arrow: ->
- This tells the engine what direction traffic is flowing between hosts
- Traffic from internal host -> outbound

```
action protocol from_ip port -> to_ip port (msg:"something";
content:"something"; content:"something else"; sid:10000000; rev:1;)
```

Rule Ports

- Used in tandem with the src/dst host variables
- Declares the port in which traffic for this rule will be evaluated
  - alert tcp $HOME_NET any -> $EXTERNAL_NET 9003
- Like the Hosts variables, ports may have variables as well
  - $HTTP_PORTS, $SMTP_PORTS, $FTP_PORTS, etc...
  - Configurable in conf/yaml
- Ports may be negated by placing a ! In front of it
  - $EXTERNAL_NET !80

Rule Ports (cont...)

- Ports may be expressed in various ways
  - Single port
    - 80
  - Multiple ports
    - [80,8080,443,9000]
  - Port ranges
    - [8000:9000]
  - Combination
    - $HOME_NET [1024:] -> $EXTERNAL_NET [80,800,6667:6669,!200]
    - What does this say?

Rule Ports (cont...)

- Ports may be expressed in various ways
  - Single port
    - 80
  - Multiple ports

action protocol from_ip **port** -> to_ip **port** (msg:"something";

content:"something"; content:"something else"; sid:10000000; rev:1;)

Exercise – Rule Foundations

Source	SrcPort	Host	Destination	DstPort	Protocol	Stat	Length	Info
192.168.4.151	49689		137.74.223.62	80	TCP		0	49689→80 [SYN] Seq=0 Win=8192 Len=0 MSS=1464 WS=4
137.74.223.62	80		192.168.4.151	49689	TCP		0	80→49689 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MS
192.168.4.151	49689		137.74.223.62	80	TCP		0	49689→80 [ACK] Seq=1 Ack=1 Win=65900 Len=0
192.168.4.151	49689	free.diendancacanh.net	137.74.223.62	80	HTTP		336	GET /radio/sometime-estate-sleepy-10006700 HTTP/1.
137.74.223.62	80		192.168.4.151	49689	TCP		0	80→49689 [ACK] Seq=1 Ack=337 Win=30336 Len=0
137.74.223.62	80		192.168.4.151	49689	TCP		1318	[TCP segment of a reassembled PDU]
137.74.223.62	80		192.168.4.151	49689	TCP		1209	[TCP segment of a reassembled PDU]
192.168.4.151	49689		137.74.223.62	80	TCP		0	49689→80 [ACK] Seq=337 Ack=1319 Win=65900 Len=0
137.74.223.62	80		192.168.4.151	49689	HTTP	200	5	HTTP/1.1 200 OK (text/html)

alert ____ $_____ _____ -> $_____ _____

Exercise – Rule Foundations

Source	SrcPort	Host	Destination	DstPort	Protocol	Stat	Length	Info
10.0.2.15	1052		84.108.128.25	27132	TCP		0	1052→27132 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 S
84.108.128.25	27132		10.0.2.15	1052	TCP		0	27132→1052 [SYN, ACK] Seq=0 Ack=1 Win=65535 Len=0
10.0.2.15	1052		84.108.128.25	27132	TCP		0	1052→27132 [ACK] Seq=1 Ack=1 Win=64240 Len=0
10.0.2.15	1052		84.108.128.25	27132	TCP		8	1052→27132 [PSH, ACK] Seq=1 Ack=1 Win=64240 Len=8
84.108.128.25	27132		10.0.2.15	1052	TCP		0	27132→1052 [ACK] Seq=1 Ack=9 Win=65535 Len=0
10.0.2.15	1052		84.108.128.25	27132	TCP		0	1052→27132 [RST, ACK] Seq=9 Ack=1 Win=0 Len=0

alert ____ $_____ _____ -> $_____ _____

Exercise – Rule Foundations

Source	SrcPort	Host	Destination	DstPort	Protocol	Stat	Length	Info
10.0.25.10	1032		143.215.130.30	53	DNS			Standard query 0x9491 A ErnestRodgerRamsey.com
143.215.130.30	53		10.0.25.10	1032	DNS			Standard query response 0x9491 A ErnestRodgerRamsey.com A

alert ____ $_____ _____ -> $_____ _____

Rule Message

- msg:"DetoxCrypto Ransomware CnC Activity";
  - Not the flavor
- Arbitrary text that appears when the rule fires and is logged/alert
- Consistency is key
- Consider adding:
  - Malware architecture: Win32/64, MSIL, ELF, OSX, etc
  - Malware family/name: njRAT, Locky, CryptXXX, Zeus
  - Malware action: Checkin, Activity, Key Exchange, Heartbeat, Exfil

Rule Message - Exercise

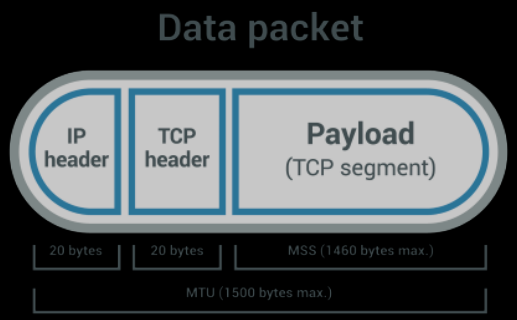
- msg:"Zeus Variant Checkin"; ✓
- msg:"IP Lookup"; ✗
- msg:"Unknown Exploit Kit Plugin Check"; ✓
- msg:"CnC Activity"; ✗

Flow

- Declare the originator and responder in the conversation
- Most rules we will write, we want to have the engine looking at "established" tcp sessions
- flow:<established>,<to_server|to_client>;
  - can also use from_server, from_client
- alert tcp $HOME_NET any -> $EXTERNAL_NET any
  - flow:established,to_server;
- If protocol is UDP, can use direction
  - flow : from_server;

Dsize

- Allows rule writer to match using the size of the packet payload (not http)
- Based on TCP segment length, NOT total packet length
  - Wireshark filter: tcp.len
- dsize:<number>;
- Can be represented as single number, range, greater than, or less than
  - dsize:312;
  - dsize:<300;
  - dsize:>300;
  - dsize:300<>400;



Rule Content

- The most basic building block for pattern matching
- Matching unique content in packets for detection
- Careful on what you choose
- Must use hex for certain characters
  - ; " :
- content:"some thing";
- content:"some|20|thing";
- content:"User-Agent|3a 20|";
- content:"s|00|o|00|m|00|e|00|t|00|h|00|i|00|n|00|g";

Rule Content (cont...)

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=$dJoFsAv3jSNMEYxHTTP/1.1 200 OK
Date: Sat, 13 Aug 2016 04:45:30 GMT
Server: Apache
X-Powered-By: PHP/5.2.17
Content-Length: 186
Connection: close
Content-Type: text/html

MQoxjmeGRPHGh2GVdFSPHnycHwL5i7Z4
<!-- Hosting24 Analytics Code -->
<script type="text/javascript" src="http://stats.hosting24.com/count.php"></script>
<!-- End Of Analytics Code -->
```

Rule Content (cont...)

- content:"POST";
- content:"/generate.php";
- content:"User-Agent|3a 20|DetoxCrypto";
  - Same as "User-Agent: DetoxCrypto"
- content:"publickey=";

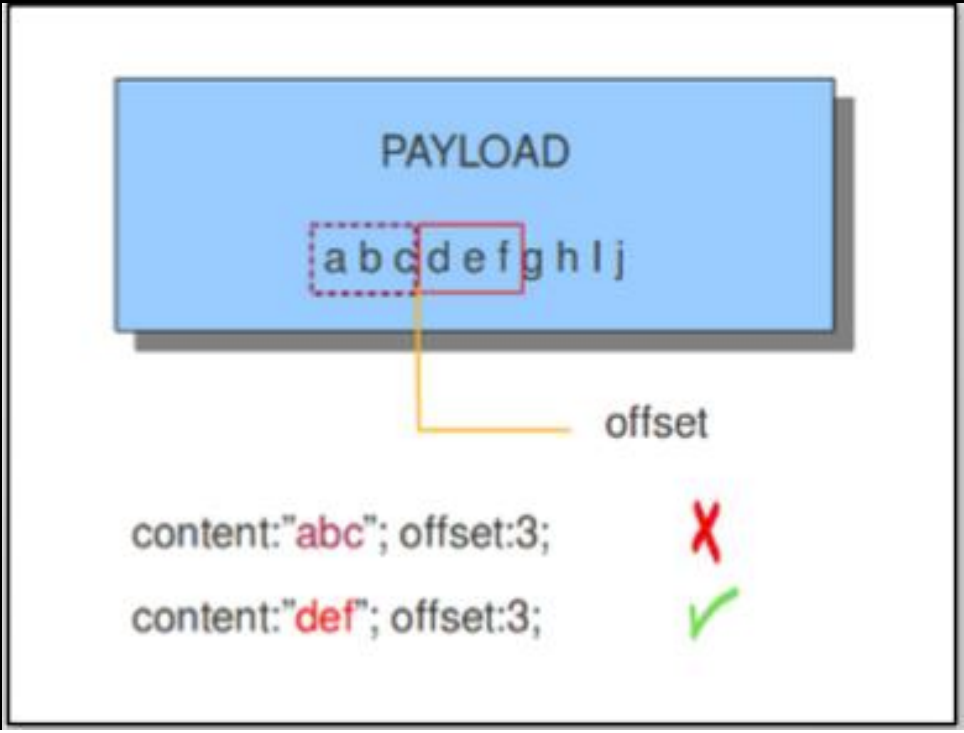
Rule Options

- Now that we have some content to match on, we can also add modifiers to assist in detection
- These can help the engine in finding exactly where content should be found
- Efficiency
- Accuracy

Offset

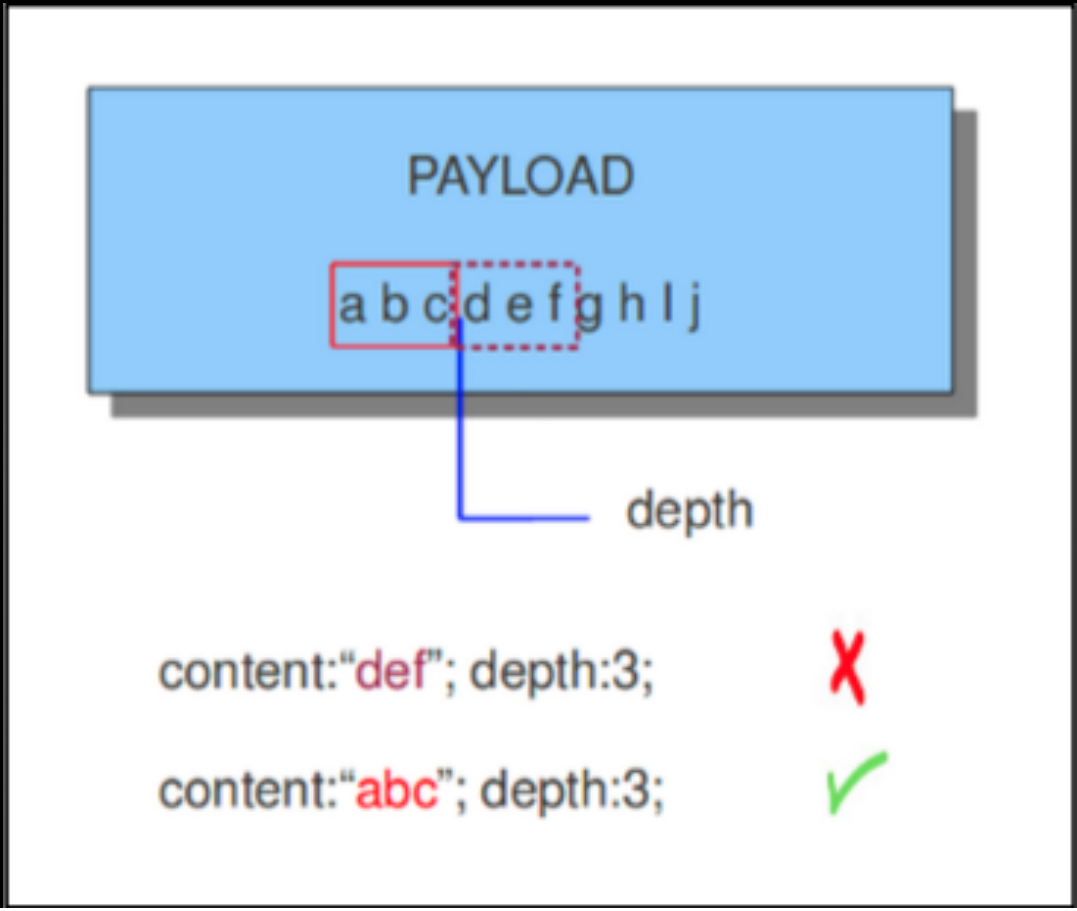
- Tells the engine to "go this far into the packet and start matching"

- content:"blah"; offset:5;
- Used in conjunction with“depth”



Depth

- Tells the engine how "deep" into the packet the content should be found
- content:"blah"; depth:4;
- Assumes offset:0; if not given



Offset + Depth

- Always together forever and ever

```
alert tcp $EXTERNAL_NET any -> $HOME_NET 3306 (msg:"ET CURRENT_EVENTS MySQL Malicious
Scanning 1"; flow:to_server; content:"|00 03|"; offset:3; depth:2; content:"GRANT
ALTER, ALTER ROUTINE"; distance:0; nocase; [redacted] content:"TO root@% WITH";
```

Distance

- Tells engine to look for your content n bytes relative to the previous match

- content:"something"; content:"something else"; distance:5;
- distance:0; can be used to tell the engine a content comes after another
  - content:"x"; content:"y"; distance:0; means "y" must come **after** "x"

```
alert tcp $EXTERNAL_NET any -> $HOME_NET 3306 (msg:"ET CURRENT_EVENTS MySQL Malicious
Scanning 1"; flow:to_server; content:"|00 03|"; offset:3; depth:2; content:"GRANT
ALTER, ALTER ROUTINE"; distance:0; nocase; [redacted] content:"TO root@% WITH";
[redacted]
```

Within

- Tells the engine how many bytes within this content will be found
- Allows us to dictate the amount of packet data being analyzed

```
alert tcp $EXTERNAL_NET any -> $HOME_NET 3306 (msg:"ET CURRENT_EVENTS MySQL Malicious
Scanning 1"; flow:to_server; content:"|00 03|"; offset:3; depth:2; content:"GRANT
ALTER, ALTER ROUTINE"; distance:0; nocase; within:30; content:"TO root@% WITH";
```

- Content match is 26 characters
- 30 bytes within the previous match, this string must exist goes with "Distance"

Negation

- We can negate content just as easy as we match content
- Rule will not fire if negated content is present
- Simply place a ! before the content
- content:!"Referer|3a 20|";
- Negate "normal" content that doesn't appear in traffic
  - Careful! Can cause False Negatives

Checking in

- content:"foo"; offset:4; depth:3; content:"bar"; distance:20; within:3;
- content:"something"; depth:9; content:"some|20|more"; distance:0
- alert udp $HOME_NET any -> $EXTERNAL_NET 53
- alert tcp $HOME_NET any -> $EXTERNAL_NET any (msg:"Something Evil”; flow:established,to_server; dsize:45;
- content:"User-Agent|3a 20|Internet"; content:!"Accept|3a|";

Rule Meta

- SID
  - Signature ID
  - sid:10000000
- Reference
  - Attach reference to our rule to help provide context
  - reference:md5, e273508a2f2ed45c20a2412f7d62eceb;
  - reference:url,malwarefor.me/2015-12-27-sundown-ek-sending-neutrino;
  - reference:cve,2016-3254;
- Revision
  - Tells us what version of the rule we are on
  - rev: 9;

Additional Rule Writing Features

fast_pattern

- Keyword placed after a content which **must** be matched before the rule is evaluated
- content:"something|20|unique"; fast_pattern;
- Should be used in every rule on most valuable content chosen by rule author
  - VERY efficient
- fast_pattern; by default is 20 bytes
  - If matching content:"User-Agent|3a 20|Mozilla/5.0 (Evilness)"; fast_pattern;
  - fast_pattern will be "User-Agent|3a 20|Mozilla/"

fast_pattern (cont...)

- If a content is longer than 20 bytes... fast_pattern “chop”
- fast_pattern:x,y;
- Allows us to choose the 20 bytes of the content we want to use for our fast_pattern
- content:”User-Agent|3a 20|Mozilla/5.0 (Evilness)”; fast_pattern:14,20;
  - fast_pattern becomes “ozilla/5.0 (Evilness)”
- content:"User-Agent|3a 20|DetoxCrypto"; fast_pattern:3,20;
  - fast_pattern becomes “r-Agent|3a 20|DetoxCrypto”

HTTP Buffer

- Suricata and Snort have the ability to parse HTTP and place packet contents into buffers to easily match.
- Much faster than searching raw packet
- We can use these to our advantage in conjunction with the other keywords and modifiers!
  - content:"User-Agent|3a 20|DetoxCrypt"; http_header; fast_pattern:3,20;

- Suricata HTTP Buffers: http://suricata.readthedocs.io/en/latest/rules/http-keywords.html

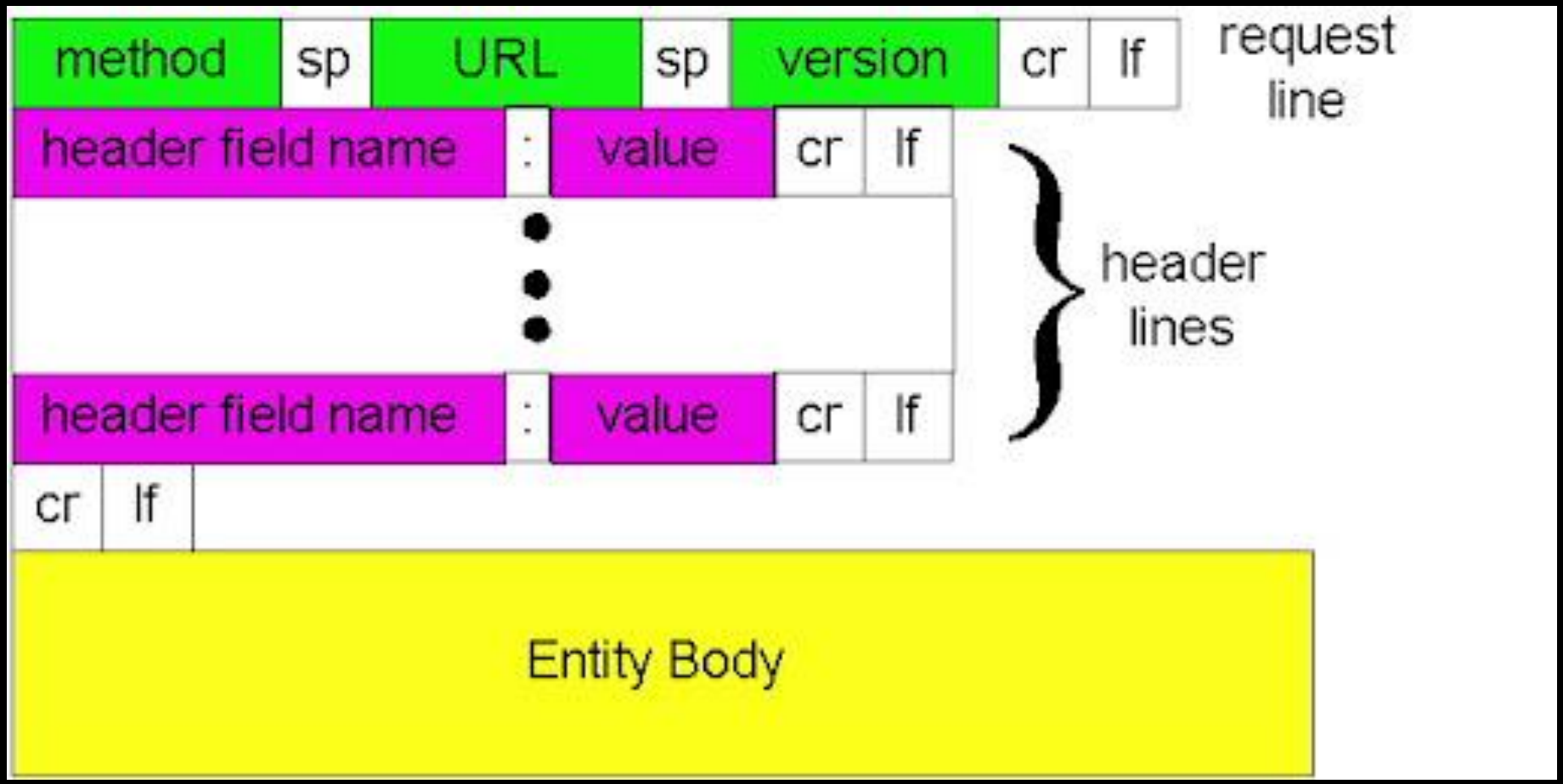
- Snort HTTP Buffers: http://manual-snort-org.s3-website-us-east-1.amazonaws.com/node32.html

HTTP Buffer (cont...)

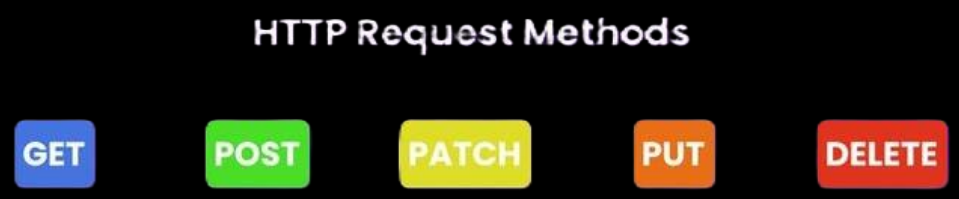
```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=dJoFsAv3jSN
Date: Sat, 13 Aug 2016
Server: Apache
X-Powered-By: PHP/5.2.
Content-Length: 186
Connection: close
Content-Type: text/htm

MQoxjmeGRPHGh2GVdFSPHn
<!-- Hosting24 Analytics Code -->
<script type="text/javascript" src="http://stats.hosting24.com/count.php"></script>
<!-- End Of Analytics Code -->
```

content:"POST"; http_method;
content:"/generate.php"; http_uri;
content:"User-Agent|3a 20|DetoxCrypto"; http_header;
content:"publickey="; http_client_body;

HTTP Request Fromat



http_method

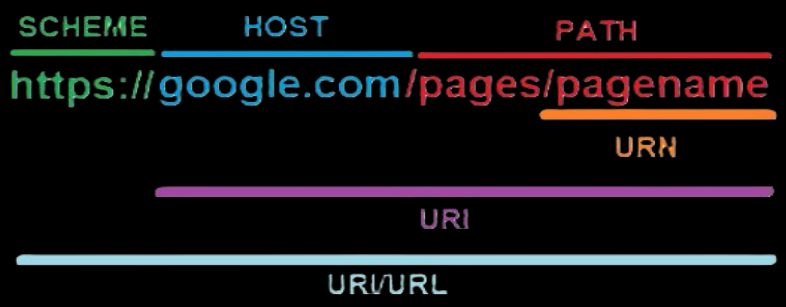


- The http_method; keyword can be used for a content involving the method in which the HTTP Request was made

- content:"GET"; http_method;
- content:"POST"; http_method;
- content:"HEAD"; http_method;

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive
```

http_uri



- Used for capturing any content present in the URI string of a request
- content:"/generate.php"; http_uri;
- urilen keyword
  - urilen:<number>;
  - Used like dsize, but for the length of the URI

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive
```

http_header

- This is used for any field present in the Header section
- content:"User-Agent|3a|"; http_header;
- content:!"Referer|3a|"; http_header;
- Cookie is not able to be used with this buffer
  - It has its own buffer ->http_cookie

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=sdJoFsAv3jSNMEYxHTTP/1.1 200 OK
```

http_client_body

- Used for an HTTP request's payload
- Commonly observed with POST requests
- content:"publickey="; http_client_body;

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=sdJoFsAv3jSNMEYxHTTP/1.1 200 OK
Date: Sat, 13 Aug 2016 04:45:30 GMT
Server: Apache
X-Powered-By: PHP/5.2.17
```

http_user_agent

- Suricata only! Fast! Use it!
- Will parse the field between User-Agent|3a 20| and |0d 0a|
- Suricata
  - content:"DetoxCrypto"; fast_pattern; http_user_agent;
- Snort
  - content:"User-Agent|3a 20|DetoxCrypto"; fast_pattern:3,20; http_header;

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
```

file_data

- Keyword used to declare content that is in the Response Body
- Used once in a rule; applies to content used after
- file_data;

```
POST /generate.php HTTP/1.1
User-Agent: DetoxCrypto2
Content-Type: application/x-www-form-urlencoded
Host: detoxcrypto.net16.net
Content-Length: 26
Expect: 100-continue
Connection: Keep-Alive

publickey=sdJoFsAv3jSMMEYxHTTP/1.1 200 OK
Date: Sat, 13 Aug 2016 04:45:30 GMT
Server: Apache
X-Powered-By: PHP/5.2.17
Content-Length: 186
Connection: close
Content-Type: text/html
```

HTTP Response Headers

```
MQoxjmeGRPHGh2GVdFSPHnycHwL5i7Z4
<!-- Hosting24 Analytics Code -->
<script type="text/javascript" src="http://stats.hosting24.com/count.php"></script>
<!-- End Of Analytics Code -->
```

HTTP Response Body

Additional Rule Writing Features Group Exercise

content:"/g76gyui?"; _____; depth:_;
content:"User- Agent|3a 20|Mozilla/4.0 (compatible|3b 20|MSIE 6.0|3b 20|Windows NT 5.0)|0d 0a|"; _____; content:"Connection|3a 20|Keep-Alive|0d 0a|"; _____;

```
GET /g76gyui?cNENEDif=fIcXzg HTTP/1.1
Accept: */*
Accept-Language: en-us
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)
Accept-Encoding: gzip, deflate
Host: www.bytove.jadro.szm.com
Connection: Keep-Alive
```

content:"Content-Length|3a 20|2"; _____;
content:"Content-Type|3a 20|text/html";
_____; _____; content:"<iframe src=|
22|"; depth:__; content:"width=|22|"; distance:_;
content:"height=|22|"; distance:_;
content:"_____"; fast_pattern;

```
HTTP/1.1 200 OK
Date: Fri, 02 Sep 2016 07:36:36 GMT
Server: Apache/2.2.22 (@RELEASE@)
X-Powered-By: PHP/5.3.3
Content-Length: 278
Connection: close
Content-Type: text/html; charset=UTF-8

<iframe src="http://v42pdxqt.top/?x3qJc7iaLxjHCYE=l3SKfPrfJxzFGMSUb-nJDa9GP0XCRQLPh4SGhKrXCJ-
ofSih17OIFxzsqAycFUKCqrF4Qu4Fah2h1QWScEZrmYRPFgVIove8hQLfyhSWkpGBrBSOaAhA_pSRF-
U_2AygzLJFdcomwRWA6mcCmL5PQFFd" width="468" height="60" style="position:absolute;left:-10000px;"></
iframe>
```

PCRE

welcome to hell

PCRE

- Pearl Compatible Regular Expression
- Similar to other regex vernacular (JavaScript, etc)
- Called using "pcre" followed by the regular expression
- PCRE must be wrapped in leading and trailing forward slashes
- pcre:"/something/flags";

PCRE (cont...)

- pcre:"/\/[A-Za-z0-9]{6}\.php$/U";
- Looks for 6 chars in the range followed by .php and nothing after
- Must wrap the PCRE with forward slashes ("/")
- Flags go after the last forward slash
- Anchors go after and before wrapped slashes
- Need to escape certain characters with a backslash if used literally
  - \/
  - \$
  - \?

PCRE - Special Chars

- ^
  - Leading anchor (start matching here)
  - pcre:"/^foo/P";
- $
  - Trailing anchor (nothing after)
  - pcre:"/foo$/P";
- []
  - Character setD wrap characters in brackets
  - pcre:"/[A-Za-z0-9]/U";
- ()
  - Capturing group
  - pcre:"([A-Z0-9]{8})+/";
- {}
  - Certain number, or range of something you match
  - pcre:"/[A-Za-z0-9]{5,10}/U";
  - Matches between 5 and 10 of alphanumeric
- \s
  - Matches a space
  - Good for Javascript and HTML
- \r
  - Matches Carrage return
  - Same is |0d|
- \n
  - Matches new-line
  - Same as |0a|
- .
  - Matches anything
- ?
  - Matches 1 or 0
- *
  - Matches 0 or more
- +
  - 1 or more
  - pcre:"/[A-Za-z0-9]+/U";
- ?:
  - Non-capture group
  - ALWAYS use this...
  - pcre:"/(?:this|that)/";

PCRE - Flags

- Used to represent the various buffers available in the engine
- To be used just like content + buffer

- U - http_uri;
- H - http_header;
- P - http_client_body;
- i - Makes PCRE case-insensitive
- R - Makes PCRE relative (distance:0;) to last match
- M - Multi-line matching

PCRE Group Exercise

Exercise - PCRE

- What could a PCRE look like for this traffic...? We know the
- command (URI) is between 2 and 5 characters long

```
GET /PWD HTTP/1.1
Host: cdn.fastaccesshosting.xyz
Connection: Keep-Alive

HTTP/1.1 200 OK
Server: nginx/1.0.15
Date: Tue, 08 Mar 2016 19:55:28 GMT
Content-Type: application/octet-stream
Content-Length: 283702
Last-Modified: Sun, 31 May 2015 17:47:42 GMT
Connection: keep-alive
Accept-Ranges: bytes
```

Exercise - PCRE

- Write a PCRE for this HTTP URI string, assuming the variables will change per infection

```
GET /ping.php?hostname=AMBROSE&username=peggysue&domain=AMBROSE HTTP/1.1
Accept: */*
Accept-Language: en-us
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.1; WOW64; Trident/
7.0; SLCC2; .NET CLR 2.0.50727; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media
Center PC 6.0; .NET4.0C; .NET4.0E; InfoPath.2)
Host: 52.65.108.15
Connection: Keep-Alive
```

Exercise - PCRE

- Write a PCRE for the http_header order

```
GET /g76gyui?cNENEDif=fIcXzg HTTP/1.1
Accept: */*
Accept-Language: en-us
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)
Accept-Encoding: gzip, deflate
Host: www.bytove.judro.szm.com
Connection: Keep-Alive
```

Wrapping Up

- Network analysis!
- The more you look into your network, the more likely you will be to know what “normal” and “abnormal” look like.
- Use multiple rule options together for maximum detection/efficiency
- Continue working…
  - ET OPEN Ruleset - Free to download and play with (learn from)
  - Snort Community Ruleset - Free to download and play with (learn from)
  - Security Onion – Free Ubuntu distro with Network Analysis tools
  - malware-traffic-analysis.net– PCAPs and malware samples galore
  - broadanalysis.net- PCAPs and malware samples galore

Resources

- Suricata Manual
  - http://suricata.readthedocs.io/en/latest/index.html
- Snort Manual
  - http://manual-snort-org.s3-website-us-east-1.amazonaws.com/
- The slides are from Suricata developers presentation entitled "Writing IDS Signatures for Suricata and Snort" on DefCon 25 Hacker conference and tailored to the class needs