My Bro The ELK

Obtaining Security Context from Security Events

Travis Smith

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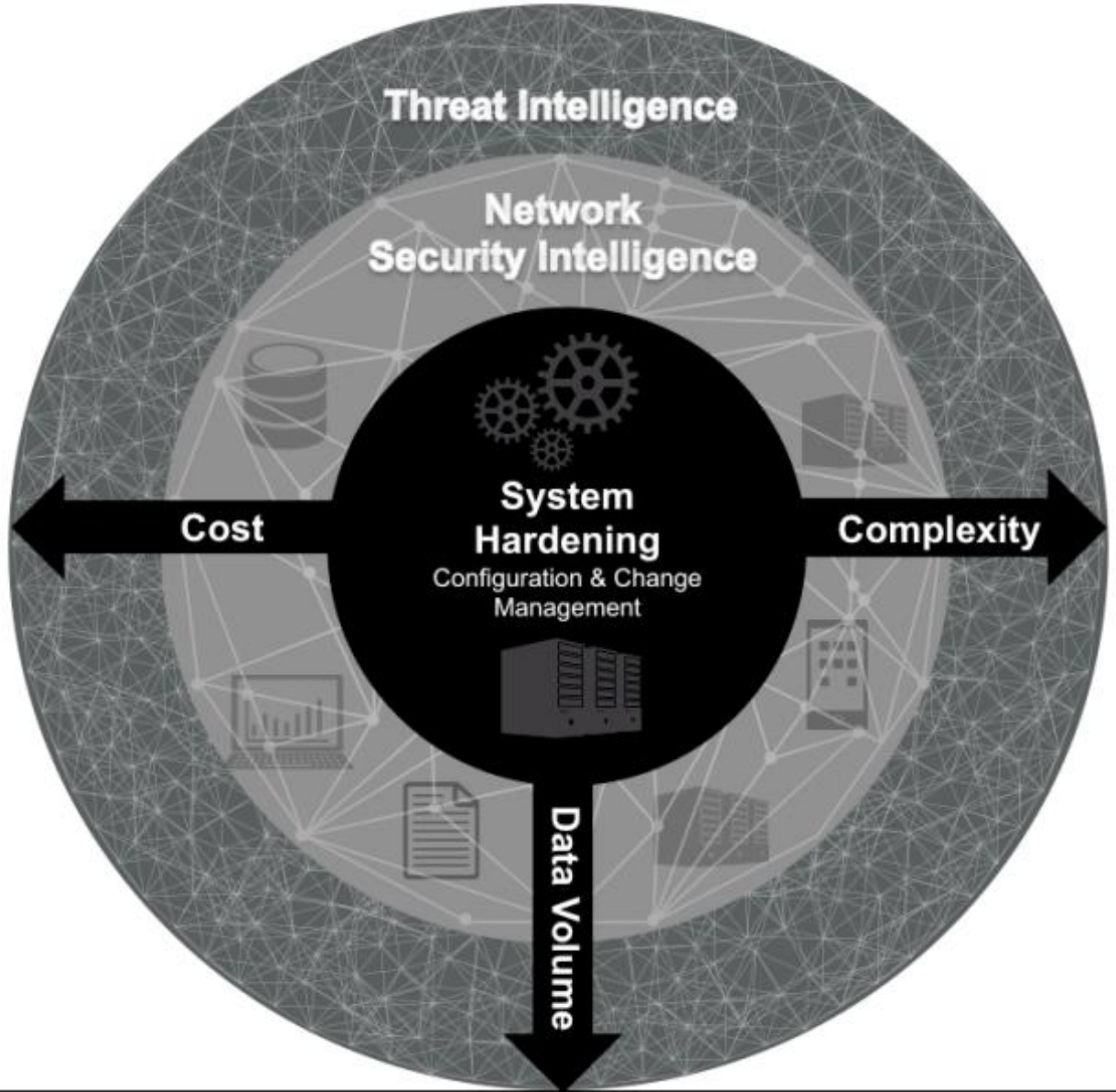
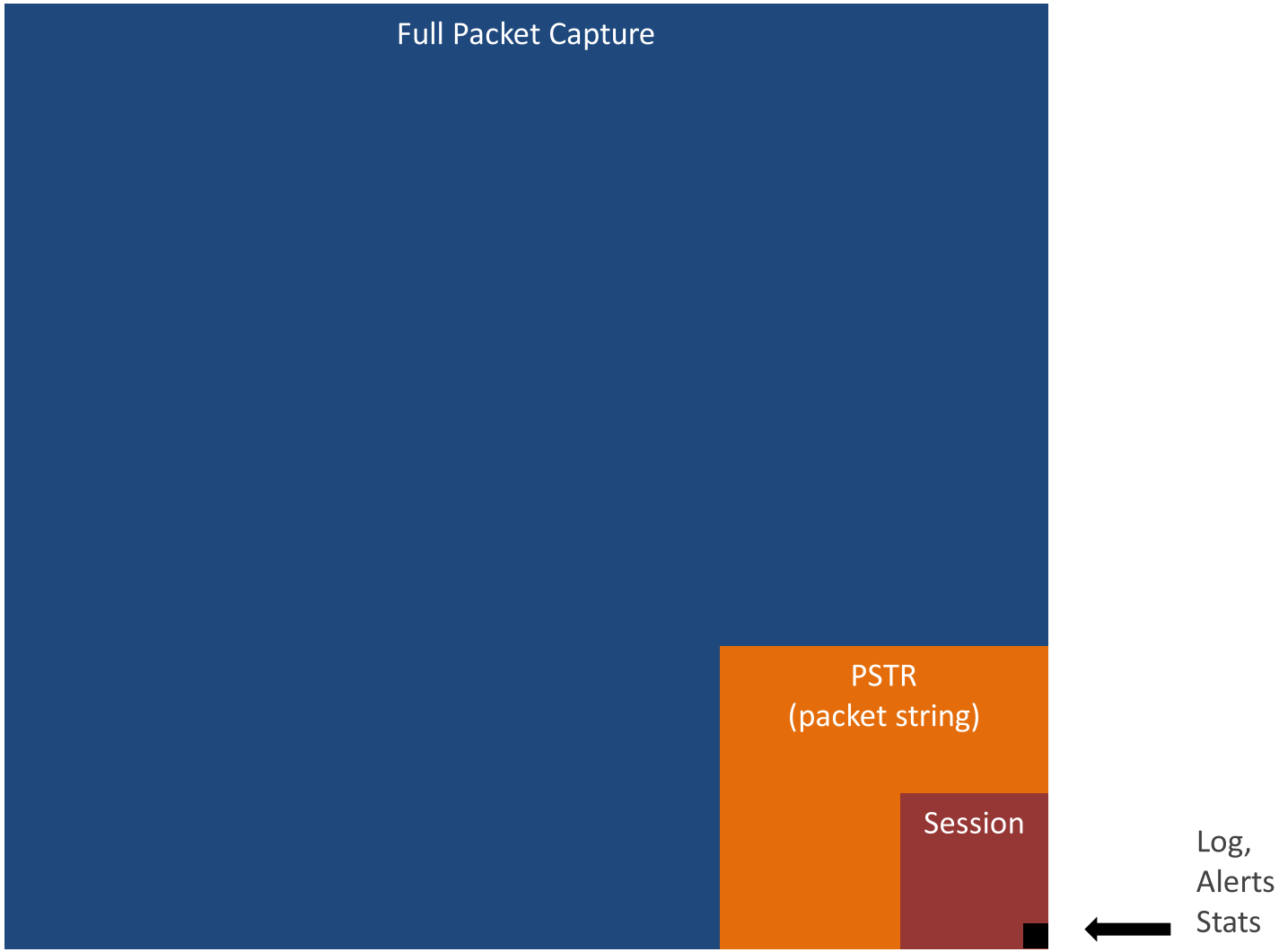
Agenda

- What is the problem?
- Who is the Bro?
- What is an ELK?
- Beefing up the ELK
- Making Your Bro the ELK Intelligent
- Visualization w/ Kibana
- Introducing the TARDIS framework


Threat Intelligence
Network
Security Intelligence
System
Hardening
Configuration & Change
Management
Cost
Complexity
Data Volume



Source: Applied Network Security Monitoring

Full Packet Capture

```
73 65 72 20 72 6F 6F 74 20 62 79 20 28 75 69 64 ser root by (uid
3D 30 29 89 70 94 50 E4 ED 0A 00 99 00 00 00 99 =0).p.P.........
00 00 00 52 54 00 DA 2C 4C 52 54 00 DA 98 99 08 ...RT..,LRT.....
00 45 00 00 8B 00 00 40 00 40 11 43 37          .E.....@.@.C7...
                  A4 DF 02 02 00 77 79 82 3C 37 38 ,.........wy.<78
3E 4E 6F 76 20 20 33 20 31 32 3A 31 37 3A 30 31 >Nov  3 12:17:01
20 64 61 74 61 62 61 73 65 20 2F 55 53 52 2F 53  database /USR/S
42 49 4E 2F 43 52 4F 4E 5B 31 38 31 33 35 5D 3A BIN/CRON[18135]:
20 28 72 6F 6F 74 29 20 43 4D 44 20 28 20 20 20  (root) CMD (
63 64 20 2F 20 26 26 20 72 75 6E 2D 70 61 72 74 cd / && run-part
73 20 2D 2D 72 65 70 6F 72 74 20 2F 65 74 63 2F s --report /etc/
63 72 6F 6E 2E 68 6F 75 72 6C 79 29 89 70 94 50 cron.hourly).p.P
13 04 0B 00 88 00 00 00 88 00 00 00 52 54 00 DA ............RT..
2C 4C 52 54 00 DA 98 99 08 00 45 00 00 7A 00 00 ,LRT......E..z..
40 00 40 11 43 48                      A4 DF @.@.CH...,....
02 02 00 66 AD DD 3C 38 36 3E 4E 6F 76 20 20 33 ...f..<86>Nov  3
20 31 32 3A 31 37 3A 30 31 20 64 61 74 61 62 61  12:17:01 databa
73 65 20 43 52 4F 4E 5B 31 38 31 33 34 5D 3A 20 se CRON[18134]:
70 61 6D 5F 75 6E 69 78 28 63 72 6F 6E 3A 73 65 pam_unix(cron:se
73 73 69 6F 6E 29 3A 20 73 65 73 73 69 6F 6E 20 ssion): session
63 6C 6F 73 65 64 20 66 6F 72 20 75 73 65 72 20 closed for user
72 6F 6F 74 42 71 94 50 62 6E 05 00 3C 00 00 00 rootBq.Pbn..<...
3C 00 00 00 52 54 00 0D 5E C5 52 54 00 DA 2C 4C <...RT..^.RT..,L
08 06 00 01 08 00 06 04 00 01 52 54 00 DA 2C 4C ..........RT..,L
            00 00 00 00 00 00              00 00 ..............+..
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Bro

conn.log
dhcp.log
dnp3.log
dns.log
ftp.log
http.log
irc.log
known_services.log
modbus.log
ius.log
smtp.log
snmp.log
ssh.log
ssl.log
syslog.log
tunnel.log
intel.log
notice.log

INPUTS

FILE | TCP/UDP | STDIN | 40+ More

FILTERS

GROK | GEOIP | TRANSLATE | TRANSLATE | 30+ More

OUTPUTS

ElasticSearch | Syslog | Email | STDOUT | 50+ More

INPUTS

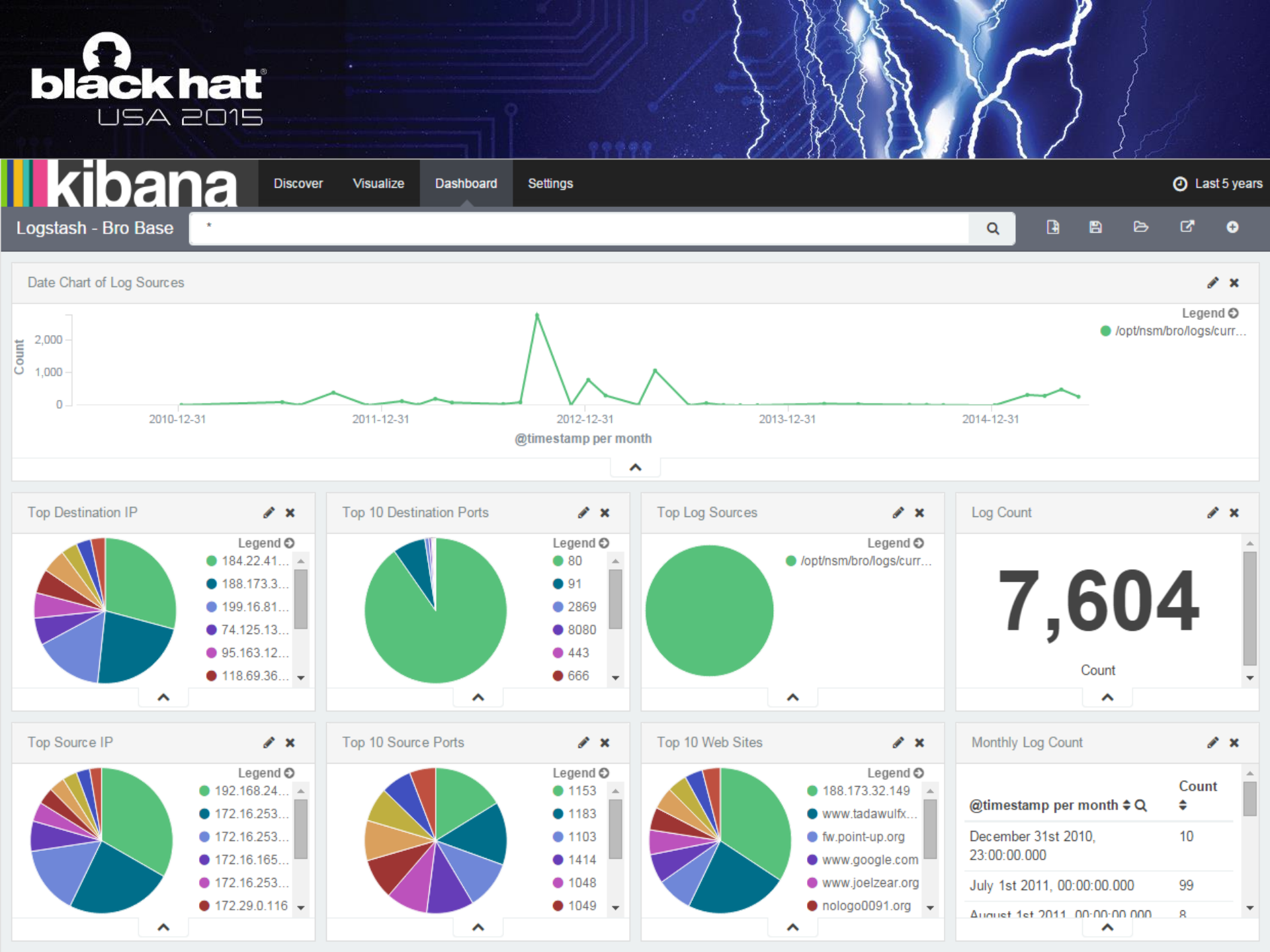
FILE | TCP/UDP | STDIN | 40+ More

FILTERS

GROK | GEOIP | TRANSLATE | TRANSLATE | 30+ More

OUTPUTS

ElasticSearch | Syslog | Email | STDOUT | 50+ More


black hat
USA 2015
kibana
Discover
Visualize
Dashboard
Settings
Last 5 years
Logstash - Bro Base
*
Date Chart of Log Sources
Legend
/opt/nsm/bro/logs/curr...
Count
2,000
1,000
0
2010-12-31
2011-12-31
2012-12-31
2013-12-31
2014-12-31
@timestamp per month
Top Destination IP
Legend
184.22.41...
188.173.3...
199.16.81...
74.125.13...
95.163.12...
118.69.36...
Top 10 Destination Ports
Legend
80
91
2869
8080
443
666
Top Log Sources
Legend
/opt/nsm/bro/logs/curr...
Log Count
7,604
Count
Top Source IP
Legend
192.168.24...
172.16.253...
172.16.253...
172.16.165...
172.16.253...
172.29.0.116
Top 10 Source Ports
Legend
1153
1183
1103
1414
1048
1049
Top 10 Web Sites
Legend
188.173.32.149
www.tadawulfx...
fw.point-up.org
www.google.com
www.joelzear.org
nologo0091.org
Monthly Log Count
@timestamp per month
Count
December 31st 2010, 23:00:00.000
10
July 1st 2011, 00:00:00.000
99
August 1st 2011, 00:00:00.000
8


black hat
USA 2015
SECURITY DATA > BIG DATA

Threat Intelligence Made Easy

uceprotect.net IP Blacklist (Conservative)

206,321 | 204

uceprotect.net IP Blacklist (Backscatterer)

140,353 | 139

hosts-file.net Malware Domains

105,107 | 215

PhishTank Intel Feed (Verified)

62,956 | 1,079

hosts-file.net Phishing Domains

51,624 | 179

blocklist.de IP Blocklist

34,912 | 173

hosts-file.net Fraud Domains

27,322 | 193

hosts-file.net Exploit Domains

25,466 | 186

hosts-file.net Ad/Tracking Domains

20,557 | 139

sysctl.org Domain Blocklist (Ads)

14,340 | 135

binarydefense.com IP Banlist

11,469 | 77

Malware Domains

9,728 | 86

Help

Critical Stack Agent

ID	NAME	LAST UPDATED	INDICATOR COUNT
1	Matsnu-Botnet-(Master-Feed)	04/03/15-10:20-am-(-0400)	9
2	C&Cs-IP-List	04/15/15-10:30-am-(-0400)	134
3	Cryptolocker-(Master-Feed)	04/14/15-01:43-pm-(-0400)	0
4	Post-Tovar-GameOver-Zeus-(Master-Feed)	03/26/15-02:12-pm-(-0400)	0
5	Tinybanker-/-Tinba-(Master-Feed)	03/26/15-02:12-pm-(-0400)	132
6	PushDo-Malware-(Master-Feed)	03/26/15-02:12-pm-(-0400)	0
7	Known-Tor-Exit-Nodes	04/16/15-11:16-am-(-0400)	6567
8	Cyber-Crime-Tracker	04/17/15-02:30-pm-(-0400)	3163
9	Zeus-Tracker:-Configs	03/26/15-02:14-pm-(-0400)	88
10	Zeus-Tracker:-Drop-Zones	03/26/15-02:14-pm-(-0400)	50
11	Zeus-Tracker:-Binaries	04/16/15-11:35-am-(-0400)	59
12	SSL-Blacklist-(SSLBL)	03/26/15-02:12-pm-(-0400)	546
13	Palevo:-Domain-Block-List	04/07/15-11:58-am-(-0400)	15
14	Palevo:-IP-Block-List	03/26/15-02:13-pm-(-0400)	14
15	Zeus-Tracker:-Domain-Block-List	03/30/15-01:23-pm-(-0400)	589
16	SpyEye:-IP-Block-List	02/19/15-01:08-pm-(-0500)	84
17	SpyEye:-Domain-Block-List	02/25/15-05:57-pm-(-0500)	127
18	PhishTank-Intel-Feed-(Verified)	04/16/15-04:57-pm-(-0400)	27734
19	Abuse-Reporting-and-Blacklisting	04/16/15-11:27-am-(-0400)	7666
20	DShield-Domain-List-(Low-Sev)	03/26/15-02:12-pm-(-0400)	4400
21	DShield-Domain-List-(High-Sev)	04/17/15-01:17-pm-(-0400)	4039
22	DShield-Domain-List-(Medium-Sev)	03/26/15-02:12-pm-(-0400)	4231
23	Malware-Domains	04/17/15-01:16-pm-(-0400)	11659
24	Scam-Domains-(Fake/Malware/Drive-By)	04/16/15-11:27-am-(-0400)	4833
25	ET:-Known-Compromised-Hosts	04/16/15-03:01-pm-(-0400)	1080
26	C&Cs-Domains	04/15/15-10:30-am-(-0400)	473
27	IP-Bad-Reputation-(Mail)	04/14/15-06:42-pm-(-0400)	101
28	IP-Bad-Reputation-(HTTP/HTTPS)	02/13/15-01:46-pm-(-0500)	87
29	IP-Bad-Reputation-(Scan)	04/01/15-04:51-pm-(-0400)	414
30	Ponmocup:-Malware-Domains	03/26/15-02:13-pm-(-0400)	12
31	Ponmocup:-Malware-IPs	04/03/15-03:38-pm-(-0400)	31
32	Ponmocup:-Botnet-IPs	04/15/15-03:57-pm-(-0400)	8
33	MTA:-Suspicious-ip/domain-(All)	03/17/15-07:43-am-(-0400)	129
34	Bebloh:-IP-List	03/27/15-07:25-pm-(-0400)	7
35	Bebloh:-Domain-List	03/26/15-02:12-pm-(-0400)	17

98 Threat Feeds

800,000+ Indicators

Logstash Filtering

- Utilizing Custom Patterns
- GROK Message Filtering
- Adding Custom Fields
- Adding Geo IP Data
- Date Match
- Using Translations for Threat Intel

Logstash Configuration

```
filter {
        grok {
                match => {
                        "message" => "%{IP:client} %{WORD:method} %{URIPATHPARAM:request}
%{NUMBER:bytes} %{NUMBER:duration}"
                }
        }
}
```

Utilize Custom Patterns

```
filter {
        grok {
                patterns_dir => "/opt/logstash/custom_patterns"
                match => {
                        message => "%{291001}“
                }
        }
}
```

/opt/logstash/custom_patterns/bro.rule

291001 (?<start_time>\d{10}\.\d{6})\t(?<evt_srcip>[\d\.]+)\t(?<evt_dstip>[\d\.]+)\t(?<evt_srcport>\d+)\t…

Message Filtering

```
filter {
    if [message] =~ /^((\d{10}\.\d{6})\t([\d\.]+)([\d\.]+)\t(\d+)\t(\d+)\t(\w+))/ {
        grok {
            patterns_dir => "/opt/logstash/custom_patterns"
            match => {
                message => "%{291001}“
            }
        }
    }
}
```

~~291001~~ (?<~~start_time~~>\d{10}\.\d{6})\t(?<~~evt_srcip~~>[\d\.]+)\t(?<~~evt_dstip~~>[\d\.]+)\t(?<~~evt_srcport~~>\d+)\t...

Add Custom Fields

```
filter {
        if [message] =~ /^((\d{10}\.\d{6})\t([\d\.]+)([\d\.]+)\t(\d+)\t(\d+)\t(\w+))/ {
                grok {
                        patterns_dir => "/opt/logstash/custom_patterns"
                        match => {
                                message => "%{291001}“
                        }
                        add_field => [ "rule_id", "291001" ]
                        add_field => [ "Device Type", "IPSIDSDevice" ]
                        add_field => [ "Object", "NetworkTraffic" ]
                        add_field => [ "Action", "General" ]
                        add_field => [ "Status", "Informational" ]
                }
        }
}
```

Geo IP

```
filter {
        .....all normalization code above here....
        geoip {
                source => "evt_dstip"
                target => "geoip_dst"
                database => “/etc/logstash/conf.d/GeoLiteCity.dat“
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][longitude]}" ]
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][latitude]}"  ]
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][city\_name]}"  ]
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][continent\_code]}"  ]
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][country\_name]}"  ]
                add_field => [ "[geoip_dst][coordinates]", "%{[geoip_dst][postal\_code]}"  ]}
        mutate {
                convert => [ "[geoip_dst][coordinates]", "float"]
        }
}
```

GeoIP Template Update

```
curl -XGET localhost:9200/_template/logstash
{"logstash":{
        "order":0,
        "template":"logstash-*",
        "settings":{
                "index.refresh_interval":"5s"
        },
        "mappings":{
                "properties":{
                        "geoip":{
                                "dynamic":true,
                                "properties":{
                                        "location":{
                                                "type":"geo_point"
                                        }
                                },
                                "type":"object"
                        },
                        …
```

```
{"logstash":{
        "order":0,
        "template":"logstash-*",
        "settings":{
                "index.refresh_interval":"5s"
        },
        "mappings":{
                "properties":{
                        "geoip_dst":{
                                "dynamic":true,
                                "properties":{
                                        "location":{
                                                "type":"geo_point"
                                        }
                                },
                                "type":"object"
                        },
                        …
```

curl -XPUT localhost:9200/_template/logstash -d '….'

Date Match

```
filter {
        ....all normalization code above here....
        ....all GeoIP code here....
        date {
                match => [ "start_time", "UNIX" ]
        }
}
```

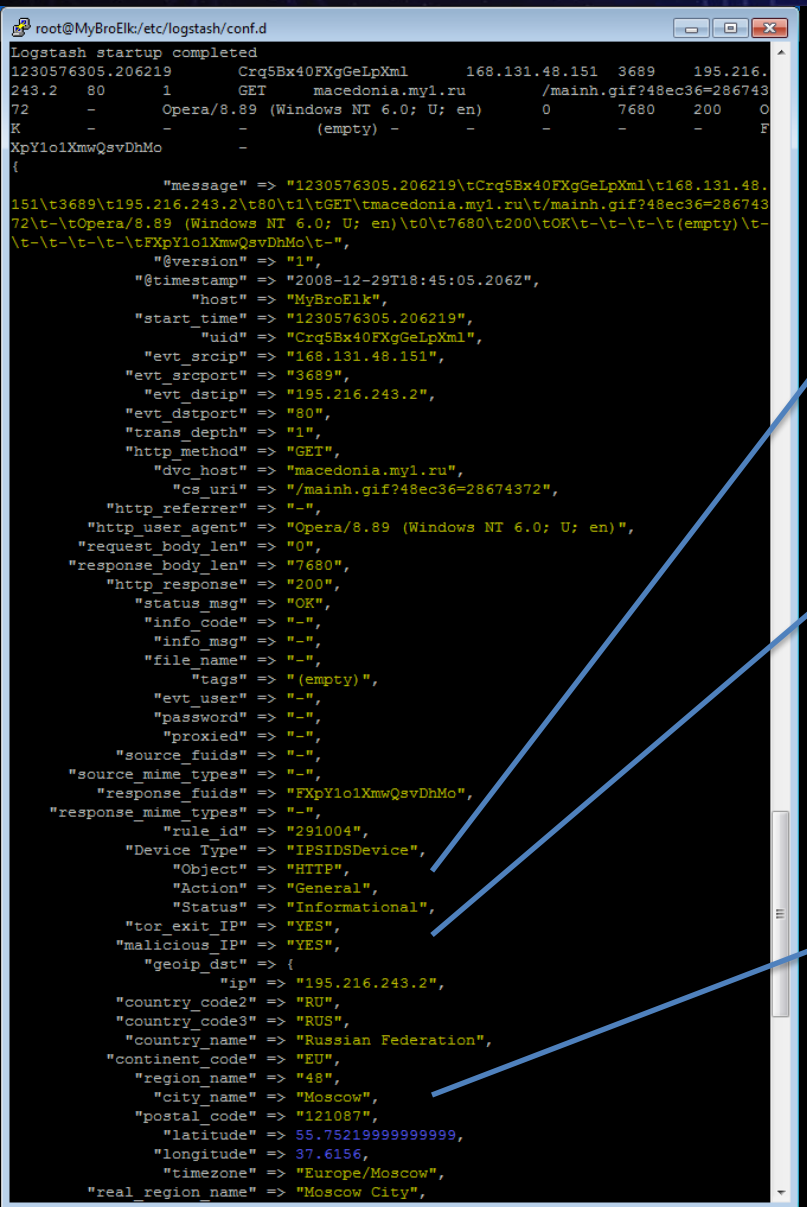
Threat Intel

```
filter {
        ....all normalization code above here....
        ....all GeoIP code here....
         translate {
                field => "evt_dstip"
                destination => "tor_exit_IP"
                dictionary_path => '/etc/logstash/conf.d/torexit.yaml'
        }
}
```

torexil.yaml

```
"162.247.72.201": "YES"
"24.187.20.8": "YES"
"193.34.117.51": "YES"
```

- Run Scripts to update the YAML files on a regular basis
- Logstash will check the YAML for updates every 300 seconds
  - Configurable by adding refresh_interval => numSeconds



Custom Fields:

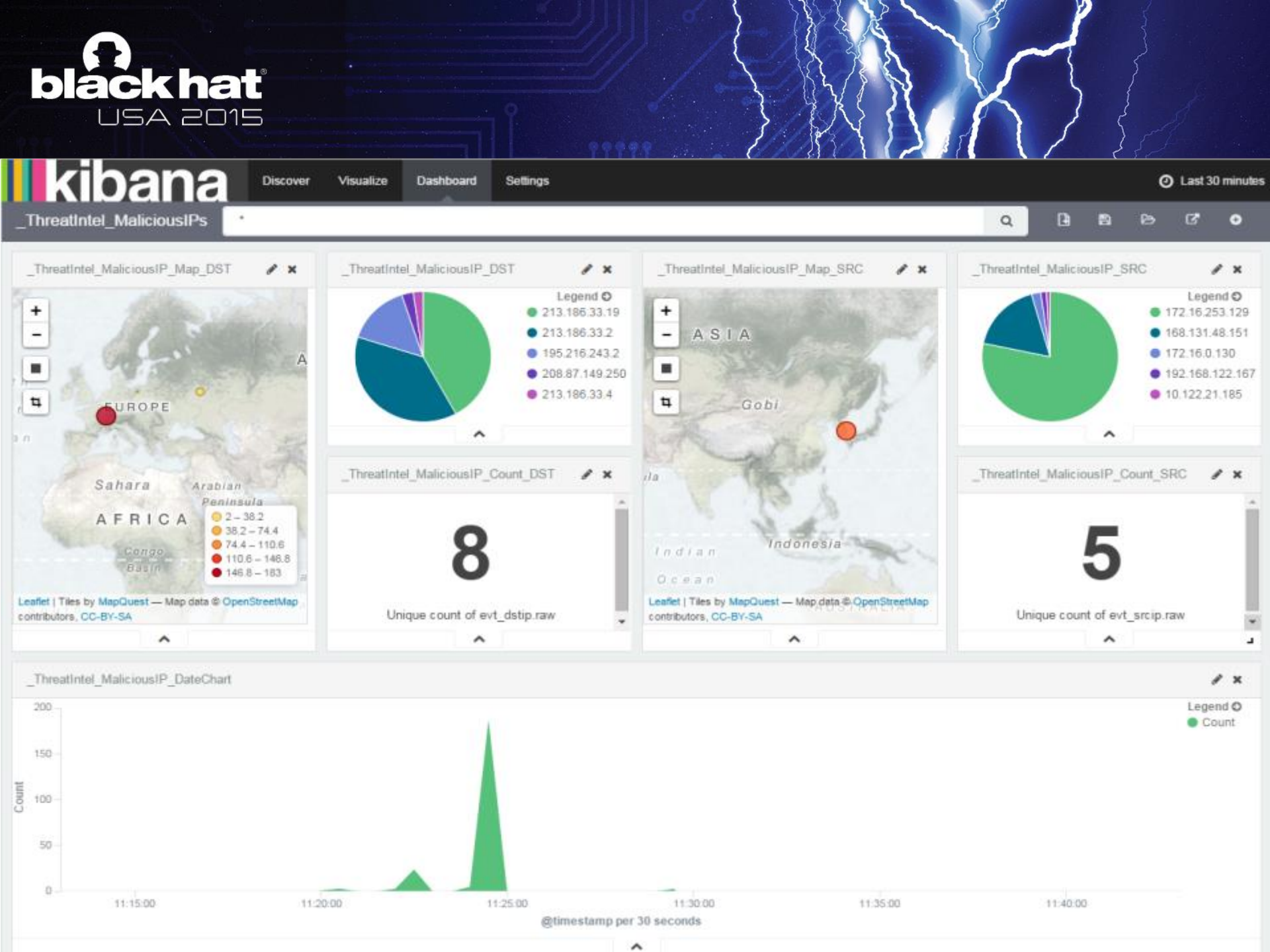
"Device Type" => "IPSIDSDevice"
"Object" => "HTTP"
"Action" => "General"
"Status" => "Informational"

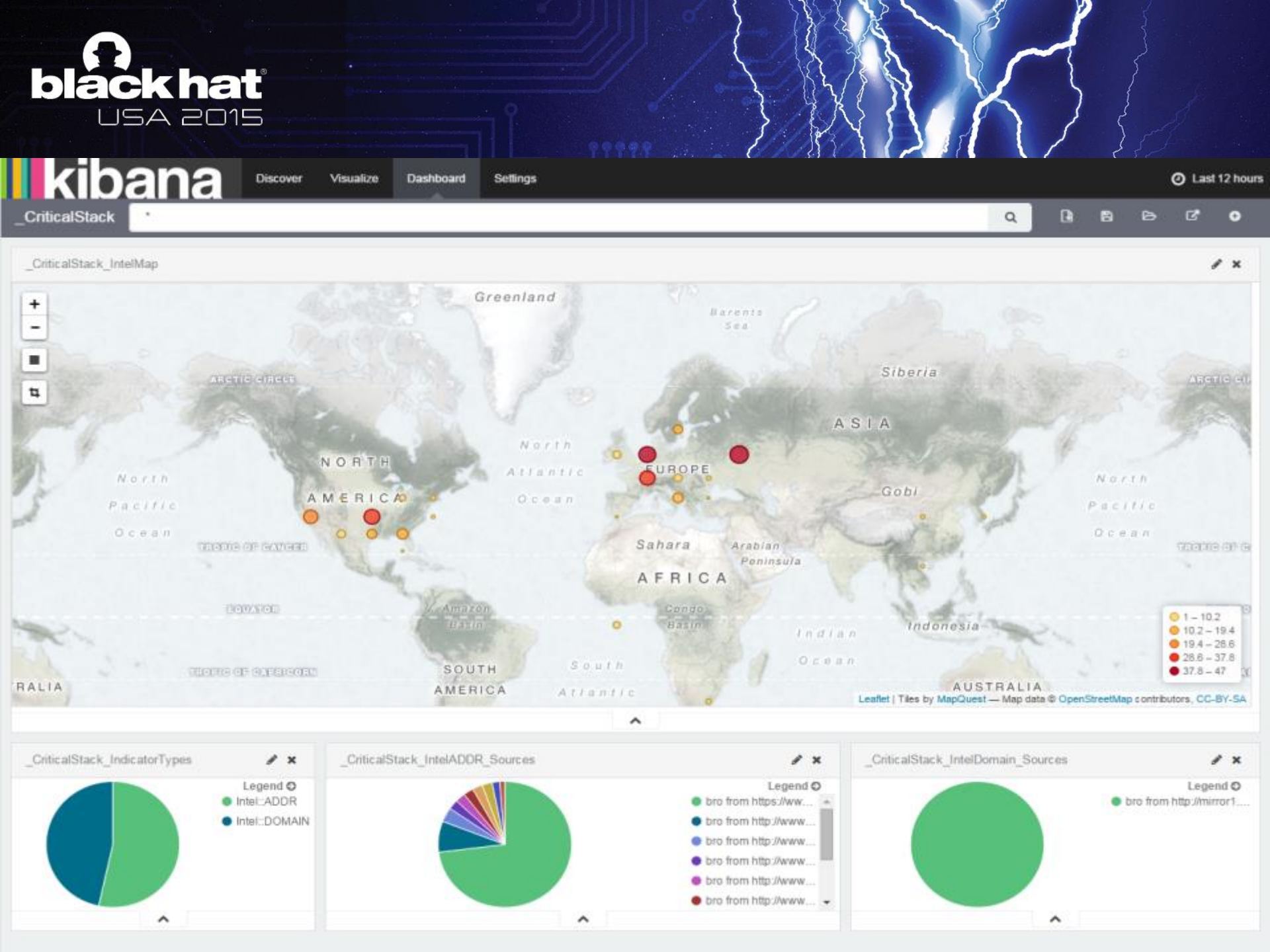
Threat Intel Translations:

"tor_exit_IP" => "YES"
"malicious_IP" => "YES"

Geo IP Data:

"country_code2" => "RU"
"country_code3" => "RUS"
"country_name" => "Russian Federation"
"continent_code" => "EU"
"city_name" => "Moscow"
"postal_code" => "121087"
"latitude" => 55.75219999999999
"longitude" => 37.6156
"timezone" => "Europe/Moscow"


black hat
USA 2015
kibana
Discover
Visualize
Dashboard
Settings
Last 30 minutes
_ThreatIntel_MaliciousIPs
*
_ThreatIntel_MaliciousIP_Map_DST
EUROPE
Sahara
Arabian Peninsula
AFRICA
Congo Basin
2 – 38.2
38.2 – 74.4
74.4 – 110.6
110.6 – 146.8
146.8 – 183
Leaflet | Tiles by MapQuest — Map data © OpenStreetMap contributors, CC-BY-SA
_ThreatIntel_MaliciousIP_DST
Legend
213.186.33.19
213.186.33.2
195.216.243.2
208.87.149.250
213.186.33.4
_ThreatIntel_MaliciousIP_Count_DST
8
Unique count of evt_dstip.raw
_ThreatIntel_MaliciousIP_Map_SRC
ASIA
Gobi
Indian Ocean
Indonesia
Leaflet | Tiles by MapQuest — Map data © OpenStreetMap contributors, CC-BY-SA
_ThreatIntel_MaliciousIP_SRC
Legend
172.16.253.129
168.131.48.151
172.16.0.130
192.168.122.167
10.122.21.185
_ThreatIntel_MaliciousIP_Count_SRC
5
Unique count of evt_srcip.raw
_ThreatIntel_MaliciousIP_DateChart
Legend
Count
200
150
100
50
0
Count
11:15:00
11:20:00
11:25:00
11:30:00
11:35:00
11:40:00
@timestamp per 30 seconds


black hat
USA 2015
kibana
Discover
Visualize
Dashboard
Settings
Last 12 hours
_CriticalStack
*
_CriticalStack_IntelMap
Greenland
Barents Sea
Siberia
ARCTIC CIRCLE
ASIA
NORTH AMERICA
North Atlantic Ocean
EUROPE
North Pacific Ocean
Gobi
Sahara
Arabian Peninsula
AFRICA
TROPIC OF CANCER
EQUATOR
Amazon Basin
Congo Basin
Indian Ocean
Indonesia
SOUTH AMERICA
South Atlantic
AUSTRALIA
TROPIC OF CAPRICORN
1 – 10.2
10.2 – 19.4
19.4 – 28.6
28.6 – 37.8
37.8 – 47
Leaflet | Tiles by MapQuest — Map data © OpenStreetMap contributors, CC-BY-SA
_CriticalStack_IndicatorTypes
Legend
Intel::ADDR
Intel::DOMAIN
_CriticalStack_IntelADDR_Sources
Legend
bro from https://ww...
bro from http://www...
bro from http://www...
bro from http://www...
bro from http://www...
bro from http://www...
_CriticalStack_IntelDomain_Sources
Legend
bro from http://mirror1....

The TARDIS Framework

- Threat Analysis, Reconnaissance, & Data Intelligence System
- Historical exploit/IOC detection
- Time Lord of forensic log data
- Available at

https://github.com/tripwire/tardis

- Demo at Arsenal Thursday @ 12:45

STIX
Structured Threat Information eXpression

CybOX

Import

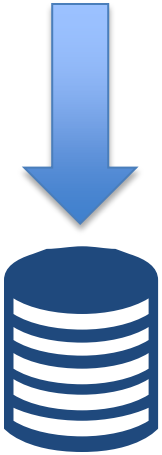
TARDIS

Search

TRIPWIRE® LOG CENTER

logstash

splunk>



```
10.10.10.10 - - [06/Aug/2015:05:00:38 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
10.10.10.10 - - [06/Aug/2015:05:00:39 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
10.10.10.10 - - [06/Aug/2015:05:00:40 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
10.10.10.10 - - [06/Aug/2015:05:00:41 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
10.10.10.10 - - [06/Aug/2015:05:00:42 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
10.10.10.10 - - [06/Aug/2015:05:00:43 -0400] "GET /cgi-bin/test.cgi HTTP/1.1" 200 525 "-" "() { test;};echo \"Content-type: text/plain\"; echo; echo; /bin/cat /etc/passwd"
```

Sound Bytes

- Use NSM With Log
- Security Tools Are Better With Intelligence
- Take Integrations to the Next Level With TARDIS

Thank You

Travis Smith

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https://github.com/Tripwire/tardis

https://github.com/TravisFSmith/MyBroElk