Data Exfiltration through DNS lookups and Botnet Control Structures

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Why is DNS a problem?

- Must be allowed through firewall
- Cannot block port 53 (DNS)
- Most environments don’t monitor DNS requests

How does DNS data exfiltration work?

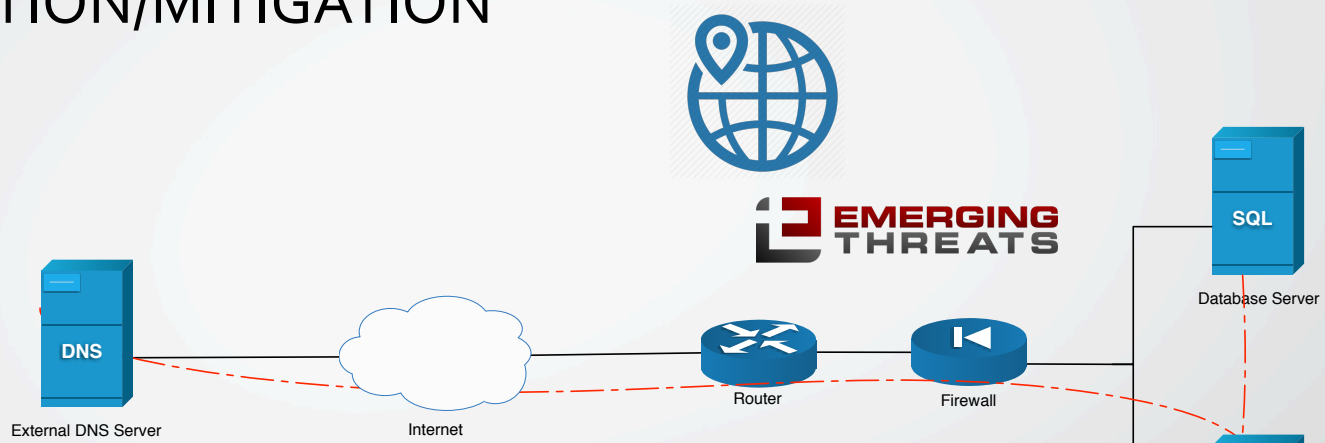
- Source sends data encoded within DNS query
- DNS query sent to authoritative server (external host)
- Destination decodes and retrieves data

DETECTION/MITIGATION

1. Block connection based on IP-reputation or Geo-location

2. Block known malicious domain names on internal DNS server

3. Traffic analysis with big-data analytics



splunk>

kibana

RPZdb

hadoop

elasticsearch

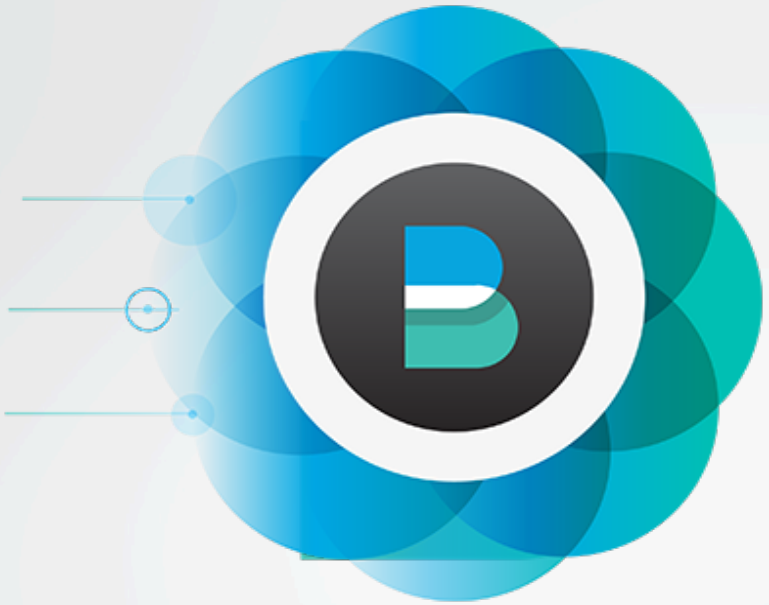
cassandra

Our Exfiltration Tools

How does our tool works

- Base 64 encoding
- 200 Bytes at a time
- DNS lookup to authoritative server
- External server reassembles packets and constructs original file

Mitigation Elasticsearch + Packetbeat



beats

elastic

+

logstash

kibana

kibana Discover Visualize Dashboard Settings

type:dns

client_ip: "127.0.0.1" Actions

packetbeat-*

Selected Fields

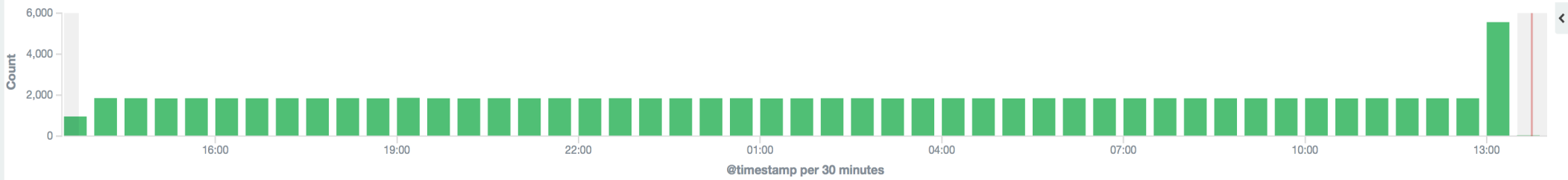
- t dns.question.name
- t client_ip
- t method
- t ip
- ? dns.question.type

Available Fields

Popular

- t _type
- t query
- t server
- t status
- t type
- @timestamp
- t _id
- t _index
- # _score
- t beat.hostname
- t beat.name
- # bytes_in
- # bytes_out
- # client_port
- t client_proc
- t client_server
- # count
- t direction
- ? dns.additionals
- ? dns.additionals_count
- ? dns.answers
- ? dns.answers_count
- ? dns.authorities

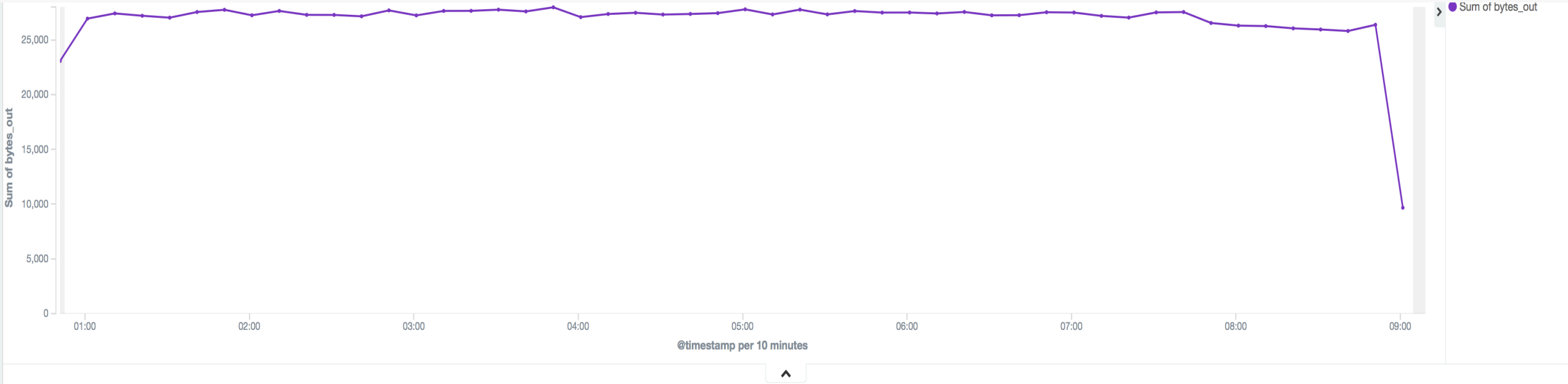
DNS 91,405 hits



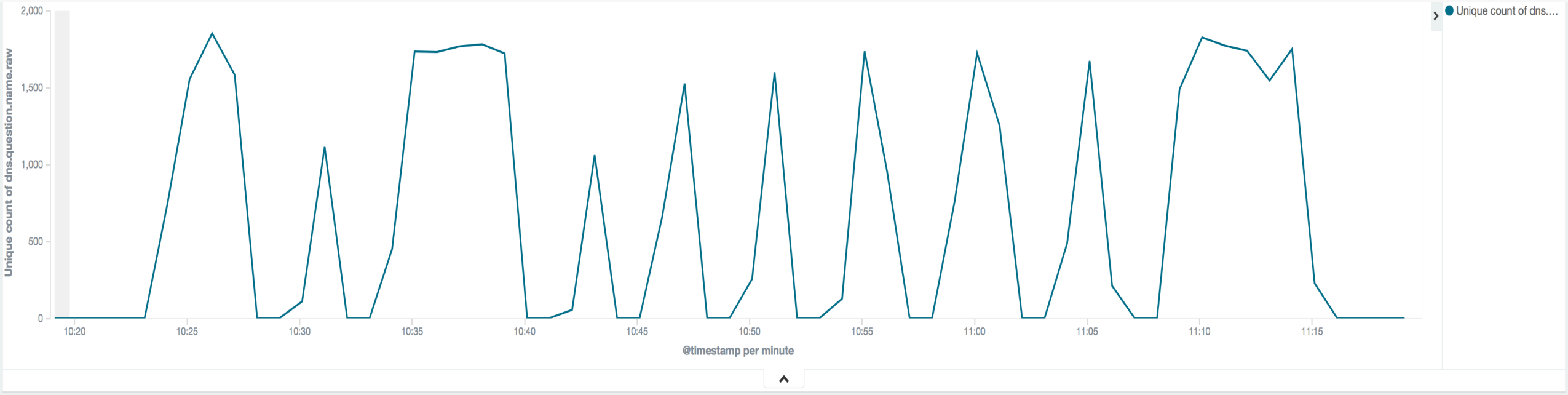
Time	client_ip	method	dns.question.type	ip	dns.question.name
August 3rd 2016, 12:37:25.992	113.17.184.25	QUERY	A	23.253.76.96	1615658263.www.baidu.com
August 2nd 2016, 21:31:29.815	204.42.253.2	QUERY	A	23.253.76.96	5eb40529.openresolvertest.net
August 3rd 2016, 02:37:15.886	209.126.136.2	QUERY	A	23.253.76.96	www.google.com
August 2nd 2016, 19:00:43.049	23.253.76.96	QUERY	A	72.3.128.241	yahoo.com
August 2nd 2016, 19:00:15.415	23.253.76.96	QUERY	A	72.3.128.241	yahoo.com
August 2nd 2016, 19:00:24.629	23.253.76.96	QUERY	A	72.3.128.241	yahoo.com
August 2nd 2016, 19:00:31.804	23.253.76.96	QUERY	A	72.3.128.241	google.com
August 2nd 2016, 19:00:35.875	23.253.76.96	QUERY	A	72.3.128.241	gmail.com
August 2nd 2016, 19:00:17.450	23.253.76.96	QUERY	A	72.3.128.241	gmail.com
August 2nd 2016, 19:00:08.238	23.253.76.96	QUERY	A	72.3.128.241	gmail.com
August 2nd 2016, 19:00:45.085	23.253.76.96	QUERY	A	72.3.128.241	gmail.com
August 2nd 2016, 19:00:14.415	23.253.76.96	QUERY	A	104.239.175.241	yahoo.com
August 2nd 2016, 19:00:42.050	23.253.76.96	QUERY	A	104.239.175.241	yahoo.com
August 2nd 2016, 19:00:58.697	23.253.76.96	QUERY	SRV	72.3.128.241	_monitoringagent._tcp.ord1.prod.monitoring
August 2nd 2016, 19:00:58.702	23.253.76.96	QUERY	A	104.239.175.241	agent-endpoint-ord.monitoring
August 2nd 2016, 19:00:56.332	23.253.76.96	QUERY	A	72.3.128.241	finance.yahoo.com
August 2nd 2016, 19:01:42.401	23.253.76.96	QUERY	A	72.3.128.241	finance.yahoo.com

Unique FQDN by count

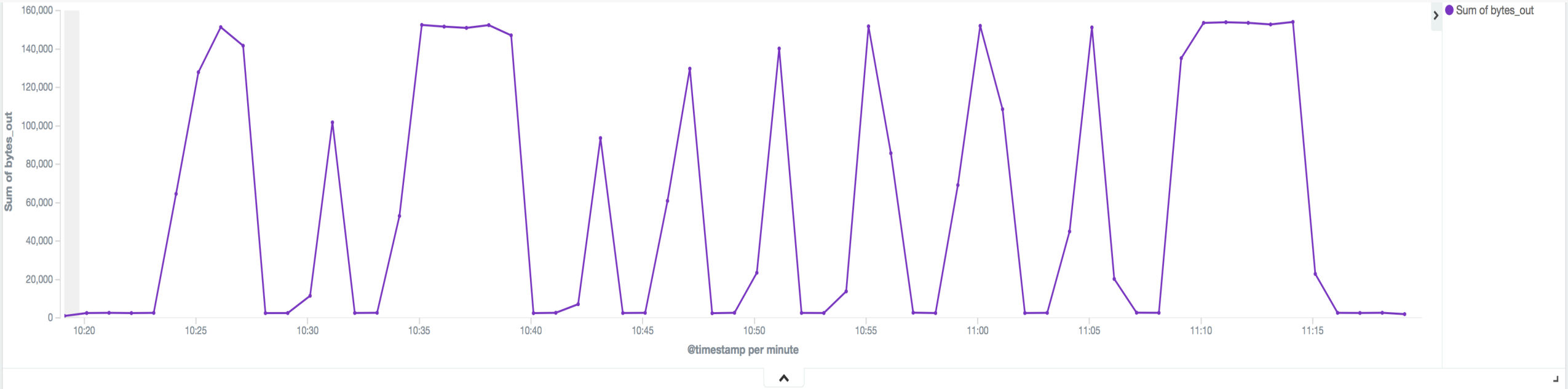
Unique FQDN in bytes



Unique FQDN by count



Unique FQDN in bytes



Top 10 unique FQDN - in bytes - by IPs