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Launching Threat Hunting from Almost Nothing

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Who am I

- Takahiro Kakumaru, CISSP
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- Focus : Cyber Threat Intelligence, Threat Hunting, Cyber Threat Intelligence sharing & consumption
- Activities : OASIS CTI TC & OpenC2 TC member, Talk at FIRST2016
- Play & coach ice hockey

Disclaimer: "The opinions expressed in this presentation and on the following slides are solely those of the presenters and not necessarily those of their employers."

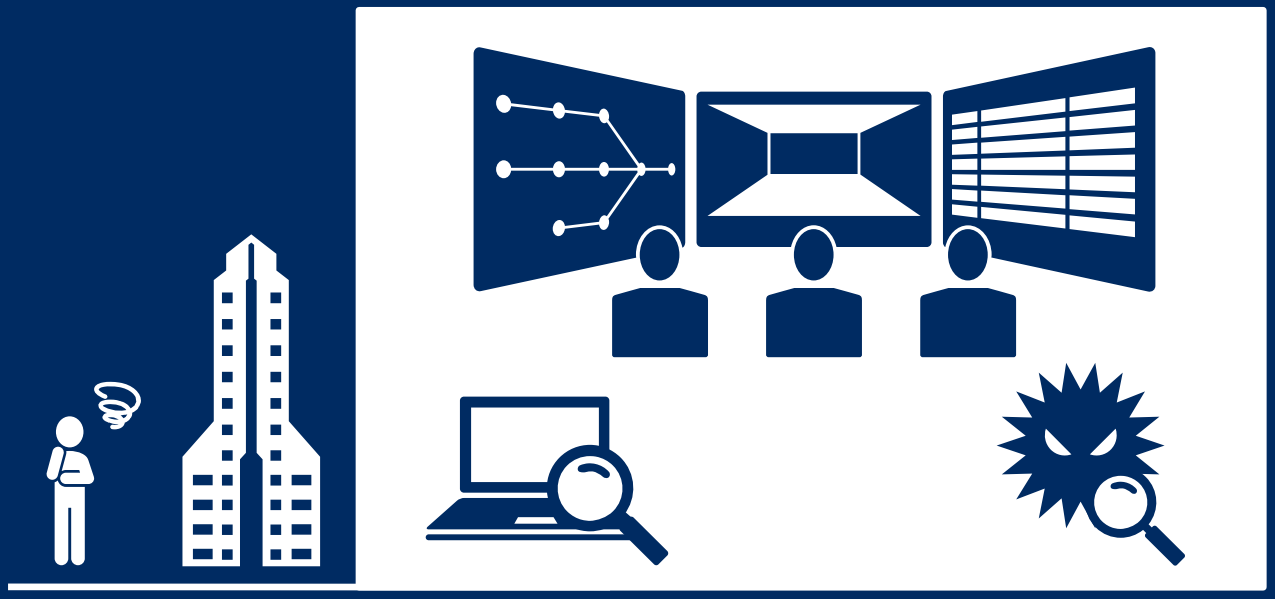
My favorite quote

"A good hockey player plays where the puck is. A great hockey player plays where the puck is going to be."

Wayne Gretzky "The Great One", the greatest hockey player ever

Today's talk

"How can we incorporate threat hunting functions into the current security operations which don't have a sophisticated hunter?"



Security Operations in the enterprise

Why I am here today

1. To share case study focusing on threat hunting operations in enterprise security operations.
2. To emphasize the importance of the process, communication, and culture.

Note: This presentation is going to be about operations, not specific hunting techniques.

Agenda

1. Introduction to Threat Hunting Operations
2. Let's get quick win!
3. Building Threat Hunting Operations
4. Threat Hunting Case Study
5. Threat Hunting Operations At Scale
6. Threat Hunting Operations Framework

Introduction to Threat Hunting Operations

Threat Hunting is the PROCESS

"Cyber Threat Hunting is the process of proactively and iteratively searching through networks to detect and isolate advanced threats that evade existing security solutions."

https://sqrrl.com/media/Framework-for-Threat-Hunting-Whitepaper.pdf

Characteristics of a THREAT HUNTER

"Threat Hunter is a cybersecurity threat analyst who uses proactive methods to uncover security incidents that might otherwise go undetected."

"Communicative"

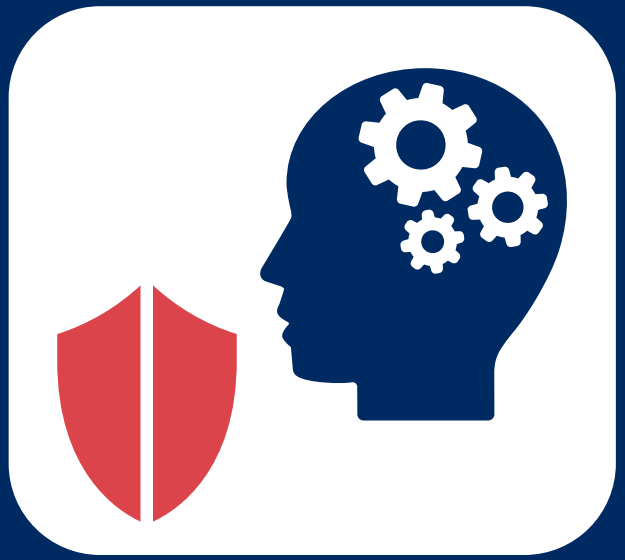
"Collaborative"

"Creative"

"Threat Awareness"

"Critical thinker"

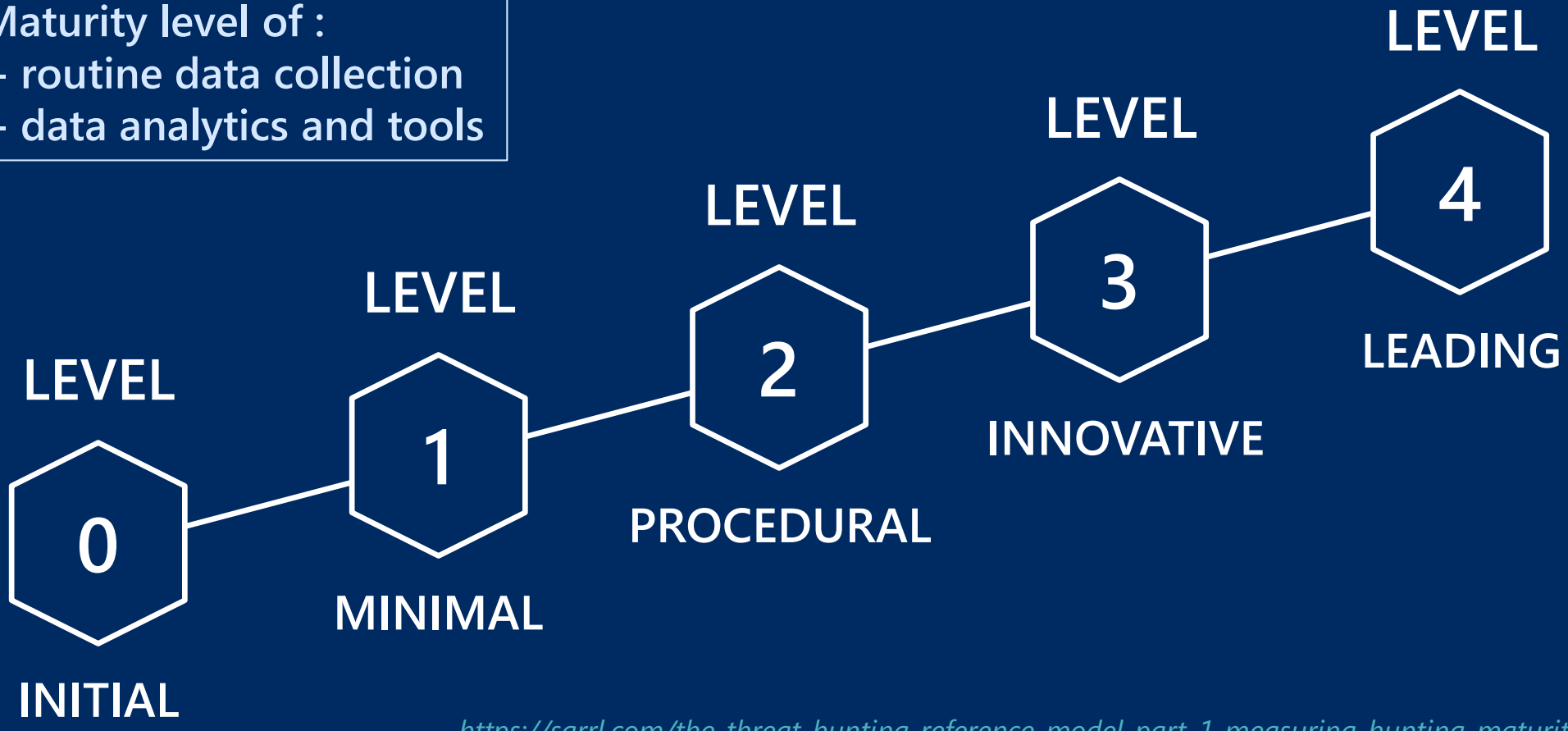
"Business knowledge"



https://searchcio.techtarget.com/definition/threat-hunter-cybersecurity-threat-analyst

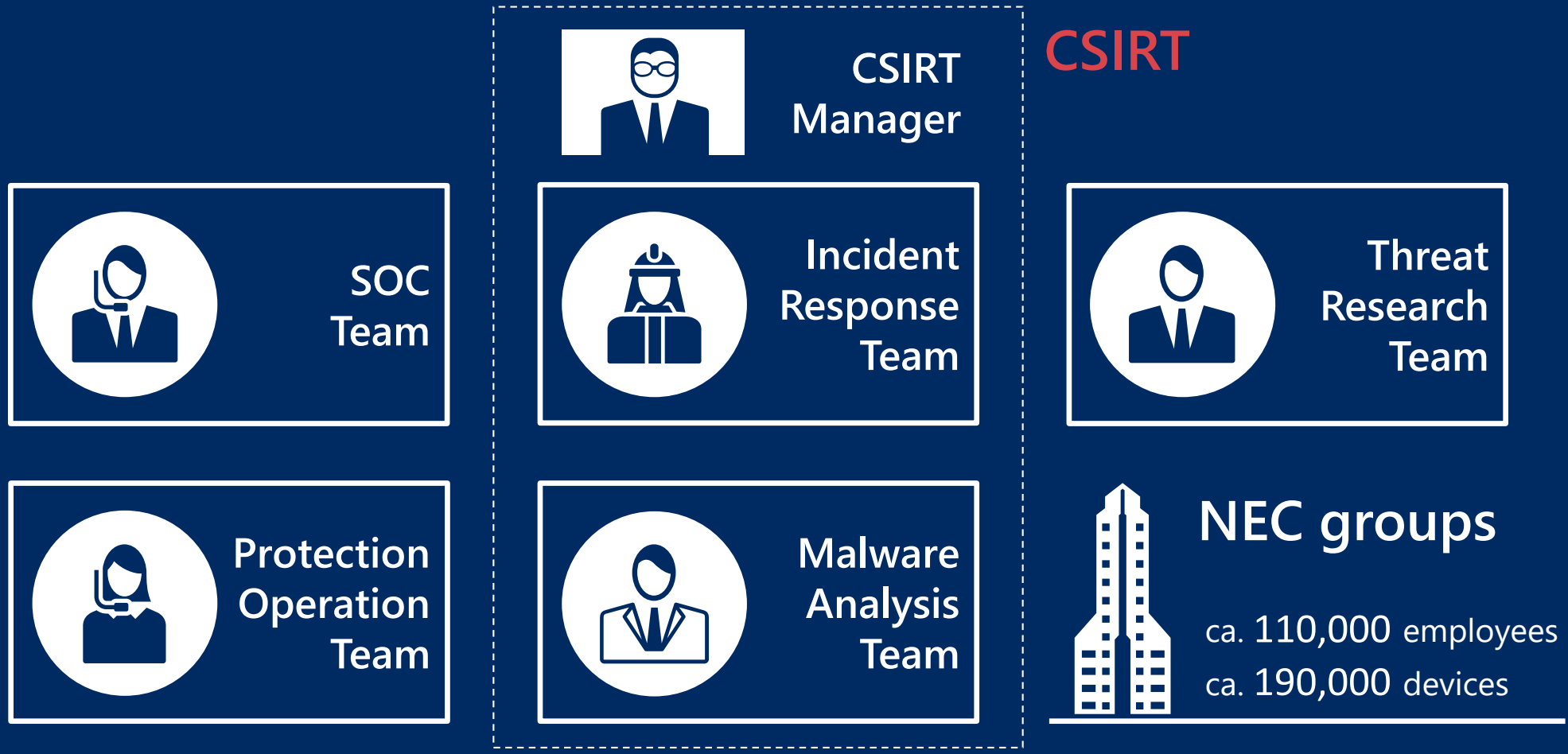
Threat Hunting Maturity Model (HMM)

Maturity level of :
- routine data collection
- data analytics and tools

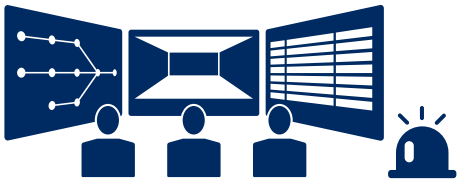


https://sqrrl.com/the-threat-hunting-reference-model-part-1-measuring-hunting-maturity/

Our Security Operations



Security Tools (1)

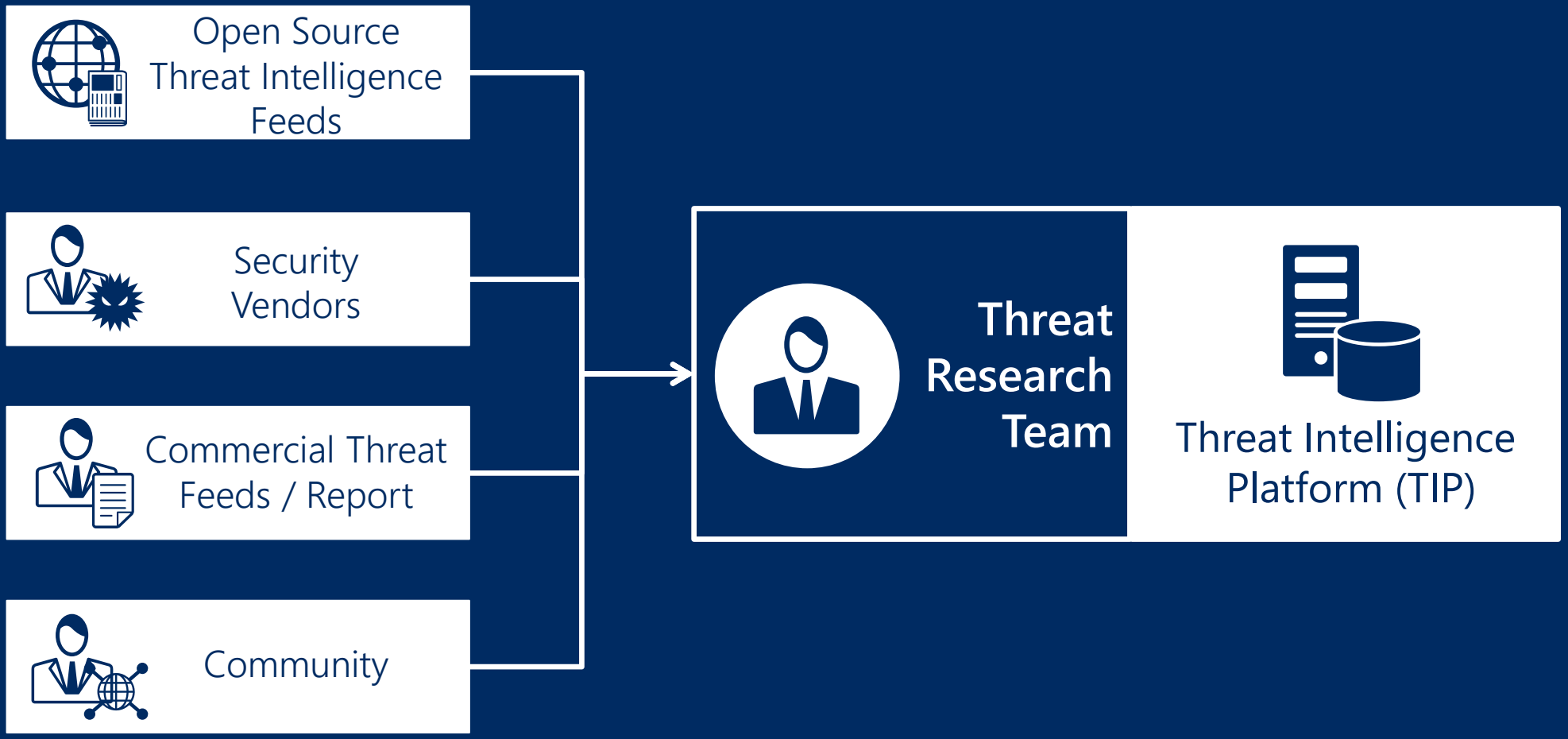
SOC Team	 Alerting System (IDS)	 Report from employee
Protection Operation Team	 Perimeter defense (Proxy, FW)	 Network Isolation (SDN)	 Patch Management System (NCSP)	 Information Sharing / Enlightenment

*NCSP: NEC Cyber Security Platform

Security Tools (2)

Incident Response Team	 Forensic Tool	 Log Management
Malware Analysis Team	 Malware Analysis Tool	 Malware DB

Security Tools (3)



Let’s get quick win!

Let's get quick win!

Primary Threat Hunting Techniques

https://sqrrl.com/media/ebook-web.pdf

IOC searches

Indicators {IP address, URL} × Proxy log {IP address, URL} = ???

Our First Threat Hunting Result

IOC searches finished!!!

0 (zero) matched.

Let's confirm definition, again

"Threat Hunting is the PROCESS"

What we did

IOC searches

Indicators {IP address, URL} × Proxy log {IP address, URL} = ∅

PROCESS or TECHNIQUE

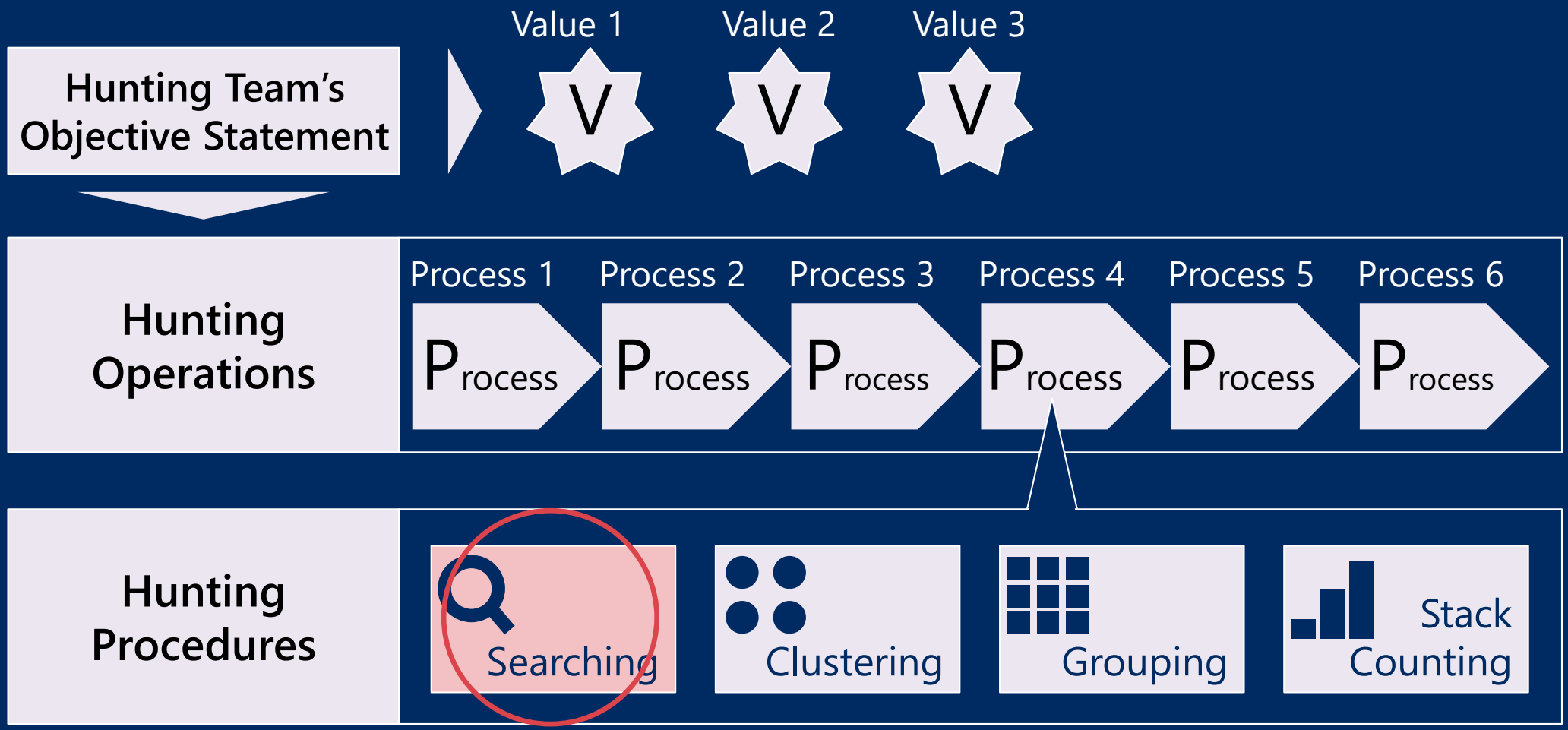
Building Threat Hunting Operations

KAIZEN

"The right process will produce the right results."

TOYOTA WAY

Outline of Threat Hunting Operations Framework



Challenges

Challenge 1:

"for what?" and "so what?"

Challenge 2:

"workable operations"

Challenge #1 “For what?” and “So what?”

“For what?”

Core values of threat hunting

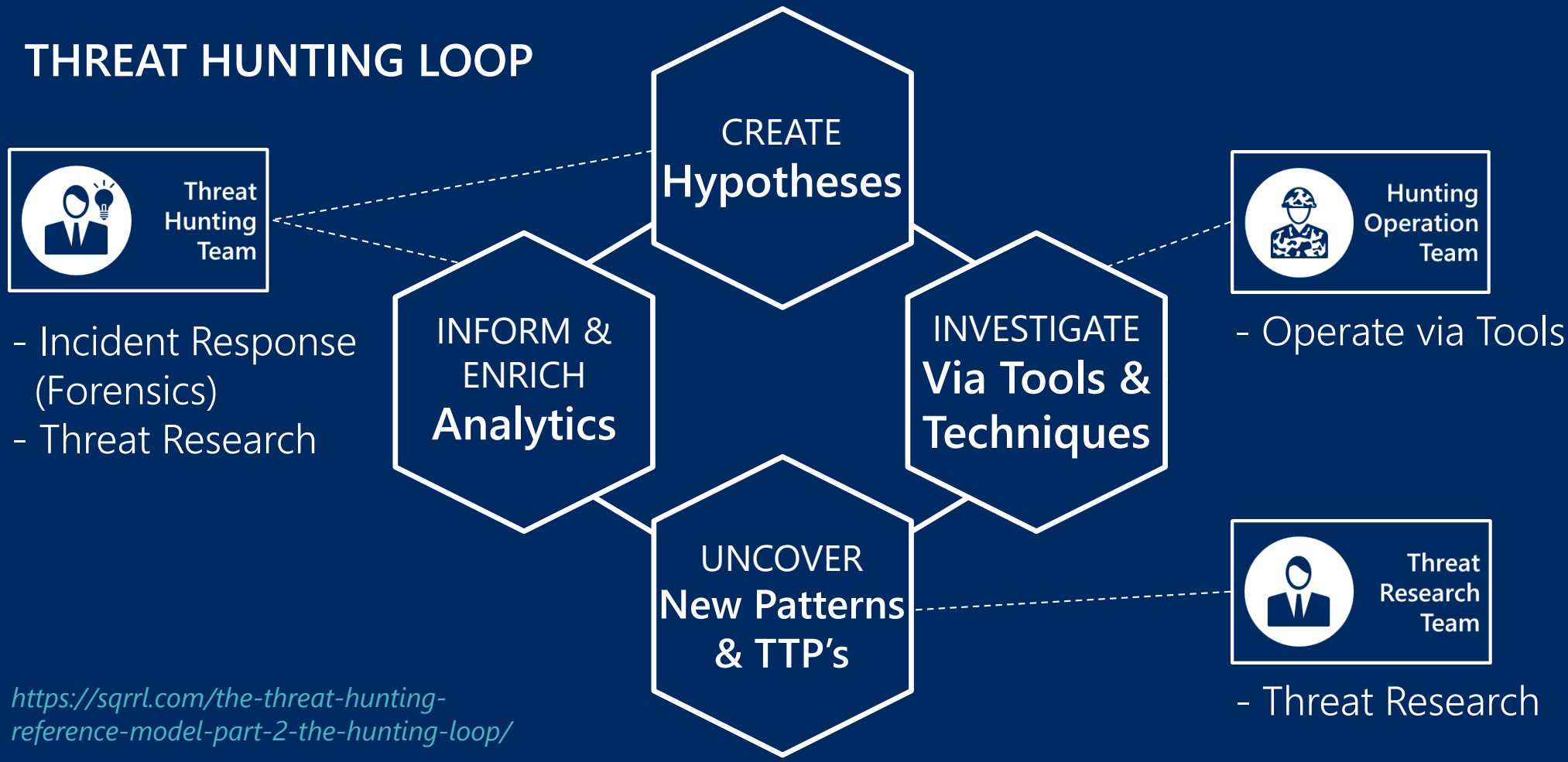
- Threat Hunting Loop (cycle)

“So what?”

Actions after finding threat from hunting

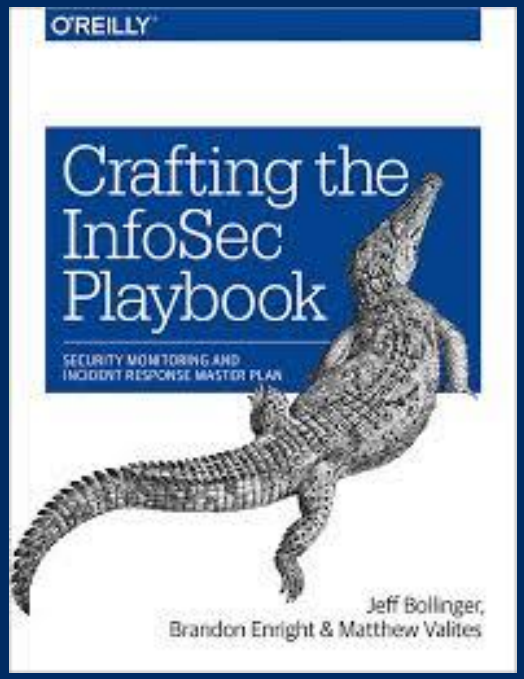
- Remediation as quickly as possible
- Close detection gap (signatures, detection rules /algorithms)

Hunting Loop is "Core"



https://sqrrl.com/the-threat-hunting-reference-model-part-2-the-hunting-loop/

Actions lead to business goals



"Crafting the InfoSec Playbook"

https://www.amazon.com/Crafting-InfoSec-Playbook-Security-Monitoring/dp/1491949406

"Understand business requirement enough before constructing the process."

Define response policy in advance

- **Escalation**
- **Precaution**
- **Mitigation**
- **Remediation**

Challenges

Challenge 1:

"for what?" and "so what?"

Challenge 2:

"workable operations"

Challenge #2 : “workable operations”

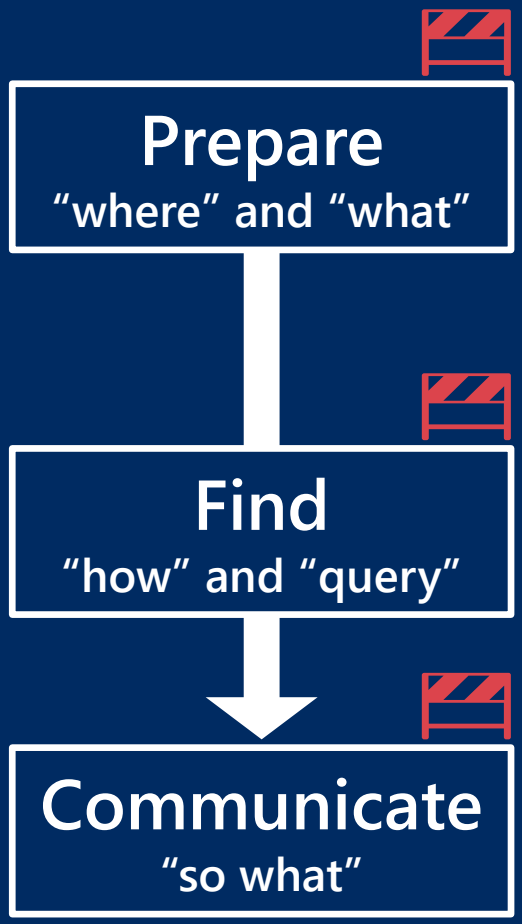
High Process

Prepare	- Ask a Question - Research - Hypothesis
Find	- Experiment - Working (Yes/No) - Troubleshoot
Commu-nicate	- Analyze and Draw Conclusions - Communicate All Results - Refactor include in Future Hunts

https://www.first.org/resources/papers/conf2017/Building-a-Threat-Hunting-Framework-for-the-Enterprise.pdf

Minimum Cycle

Jump the hurdle to getting the milestone



1. Simple first and collect from outside

a. Intelligence-driven
b. Situational awareness
c. Domain expertise

https://www.sans.org/reading-room/whitepapers/threats/generating-hypotheses-successful-threat-hunting-37172

2. Practicable execution procedure

a. Minimum data collection
b. User-friendly tools

3. Actionable course of actions

a. Understandable
b. Evidence to lead actions

CSIRT with Threat Hunting Capabilities

SOC Team

Protection Operation Team

CSIRT

CSIRT Manager

Incident Response Team

Malware Analysis Team

Threat Research Team

Threat Hunting Team

Hunting Operation Team

Threat Hunting Operations

Threat Hunting Operations

Threat Hunting Operations

Threat Hunting Operations

Threat Hunting Operations

Threat Hunting Case Study

Case Study #1 – Malicious email notification from employee

Sandbox email scanner didn't detect spear phishing email.

Employee felt malicious email, and then notified security operation team of its.

Threat research and malware analysis team jointly analyzed it, and recognized possible targeted attack.

Let's start hunting!

Case Study #1 – Process Overview

Case Study #1 – Process Overview (1)

Case Study #1 – Process Overview (2)

Case Study #1 – Process Overview (3)

Case Study #2 – Threat Report shows malicious indicators

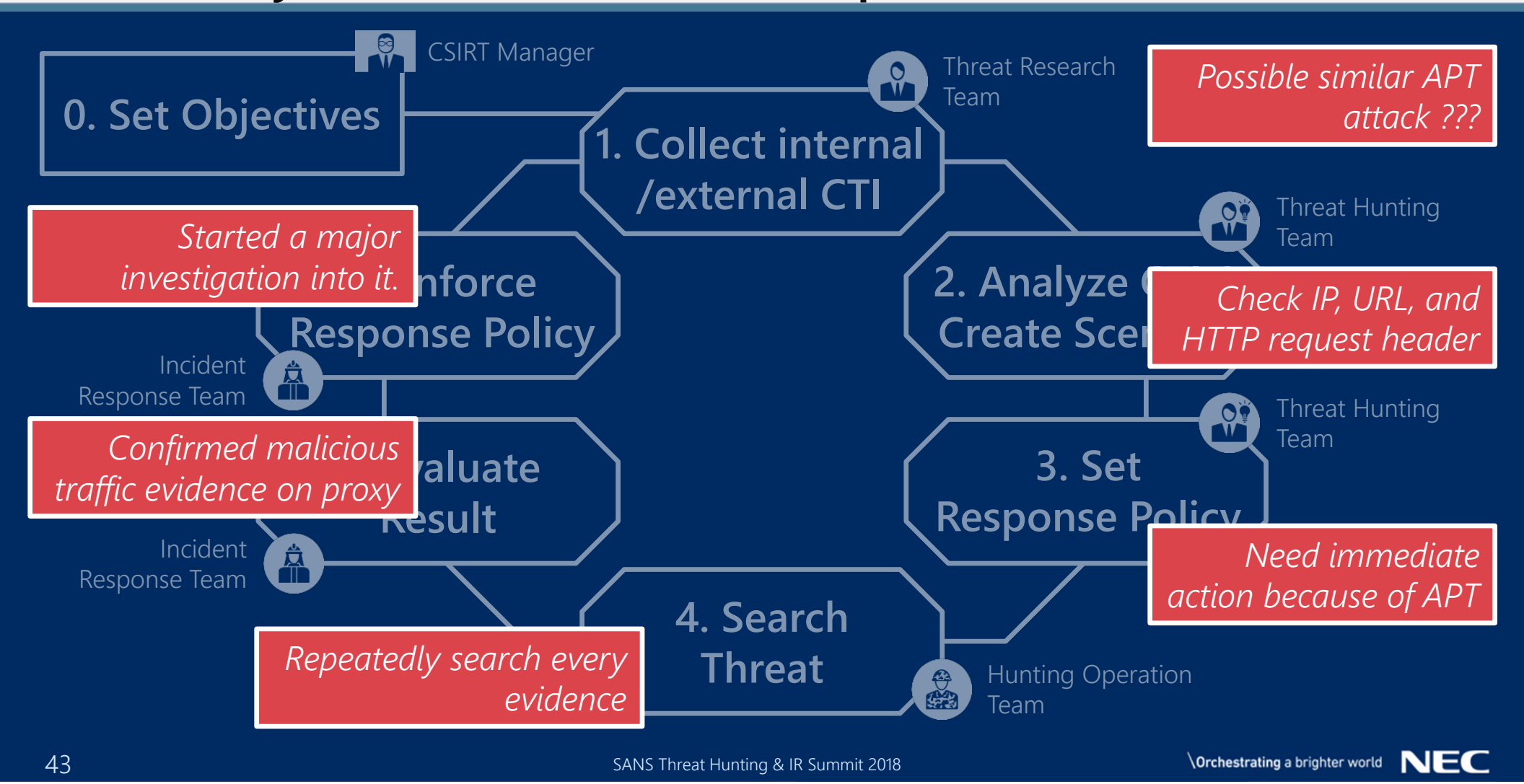
Threat research team recognized APT report shows several malicious indicators such as IP, URL, HTTP request, file path of malware, etc.

Threat hunting team wondered if same attack campaign has been happened to our organization because of intended country.

There were log collections to be verified.

Let's start hunting!

Case Study #2 – Process Overview (part 1)



Case Study #2 – Process Overview (part 1) (1)

Case Study #2 – Process Overview (part 1) (2)

Case Study #2 – Process Overview (part 1) (3)

Case Study #2 – Malware samples with characteristics

After investigation, IR team identified tens of PCs had been infected by this campaign.

Threat research team and malware analysis team looked at past attacks and TTPs attacker used.

Threat hunting team successfully generated extraction rule to this type of attack from samples.

Let's start hunting, again!

Case Study #2 – Process Overview (part 2)

Case Study #2 – Process Overview (part 2) (1)

Case Study #2 – Process Overview (part 2) (2)

Case Study #2 – Process Overview (part 2) (3)

Case Study #2 – Found additional infected PCs by pattern

```
http://www.xxx.com/{path1/path2/path3/xxx.html}
?svkrfghu=VGhpcyBpcyBzYW1wbGUxLiBUaGlzIGlzIHNhbXBsZTIuIFRoa

http://www.xxx.com/{path1/path2/path3/xxx.html}
?emexg=3YXMgc2FtcGxlMS4gVGhhdCB3YXMgc2FtcGxlMyFtcGxlMS4gVG

http://www.xxx.com/{path1/path2/path3/xxx.html}
?eprinuf=a29yZWhhIHNhbXBsZSBkZXN1MS4hhIHNhbXBBkZXN1Mi4ga29yZW
```

Variable

Host name

Parameter

*It's sample of patterning. Each value are not original one, but replaced.

- Host name are same, and length > 100.
- Variable are almost different each other.
- Length of parameter > x0 byte

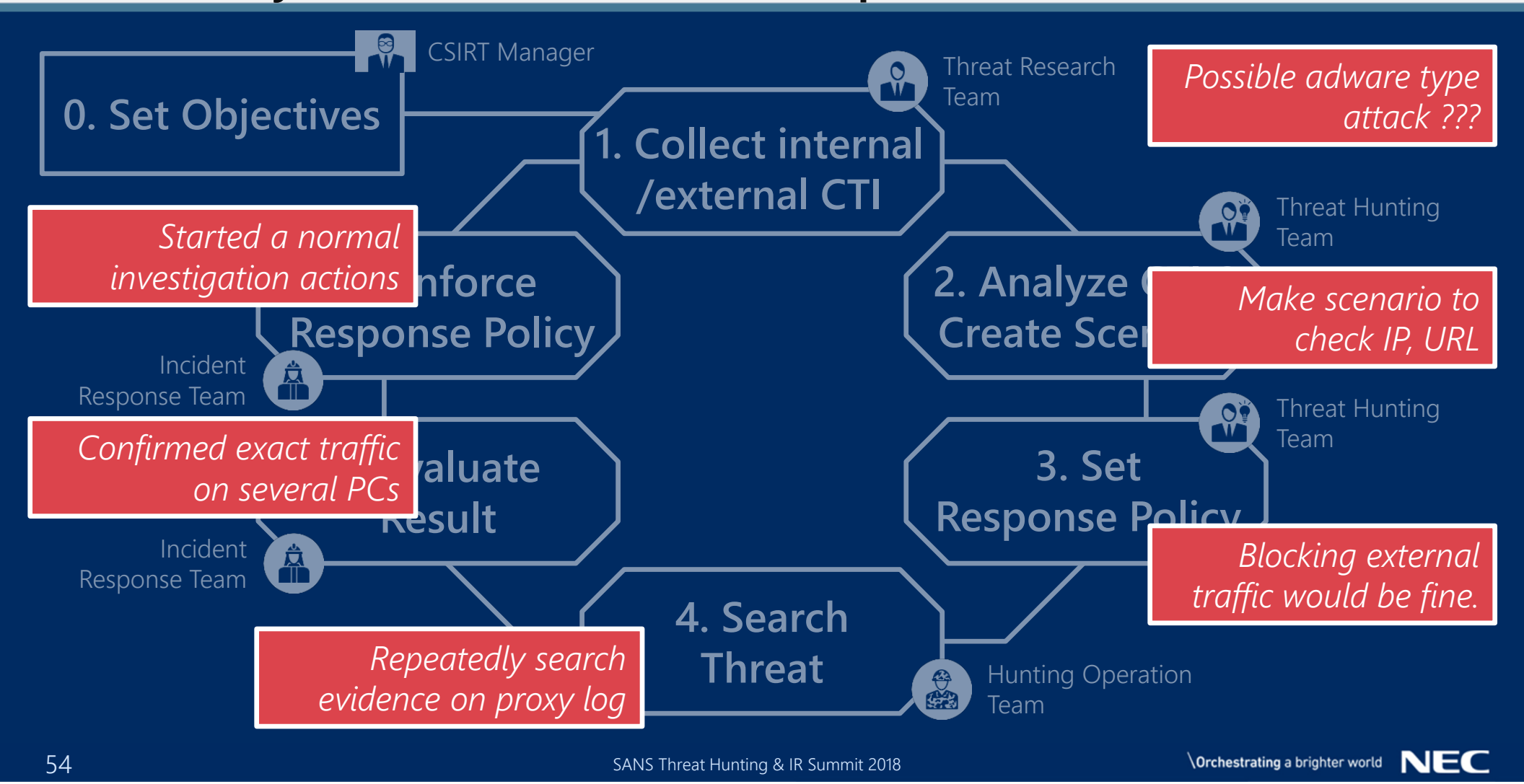
Case Study #3 – Adware, it's not Adware!?

Threat research team recognized that an unauthorized modification has been found on cleaner software, and notified it to hunting team.

Threat hunting team started looking at it within several hours after first recognition.

Let's start hunting!

Case Study #3 – Process Overview (part 1)



Case Study #3 – Process Overview (part 1) (1)

Case Study #3 – Process Overview (part 1) (2)

Case Study #3 – Process Overview (part 1) (3)

Case Study #3 – No Adware!? Software Supply Chain Attack

A few days later, software developer notified IR team as it's watering hole attack and we are one of them!?

Threat research team started analyzing threat report from the developer and looking for more information.

Threat hunting team changed response policy from adware policy to targeted attack policy immediately.

Let's start hunting, again, and rapidly!

Case Study #3 – Process Overview (part 2)

Case Study #3 – Process Overview (part 2) (1)

Case Study #3 – Process Overview (part 2) (2)

Case Study #3 – Process Overview (part 2) (3)

Lessons learned from case study

1. It’s not always have to rely on difficult hunting techniques to identity undetected threat, but build the process.
2. It’s much worth if we can find security breach by ourselves before being notified from outside.
3. Let's start from what we can do, and we should do what we can do.
4. Hypothesis generation would be still difficult part for us.

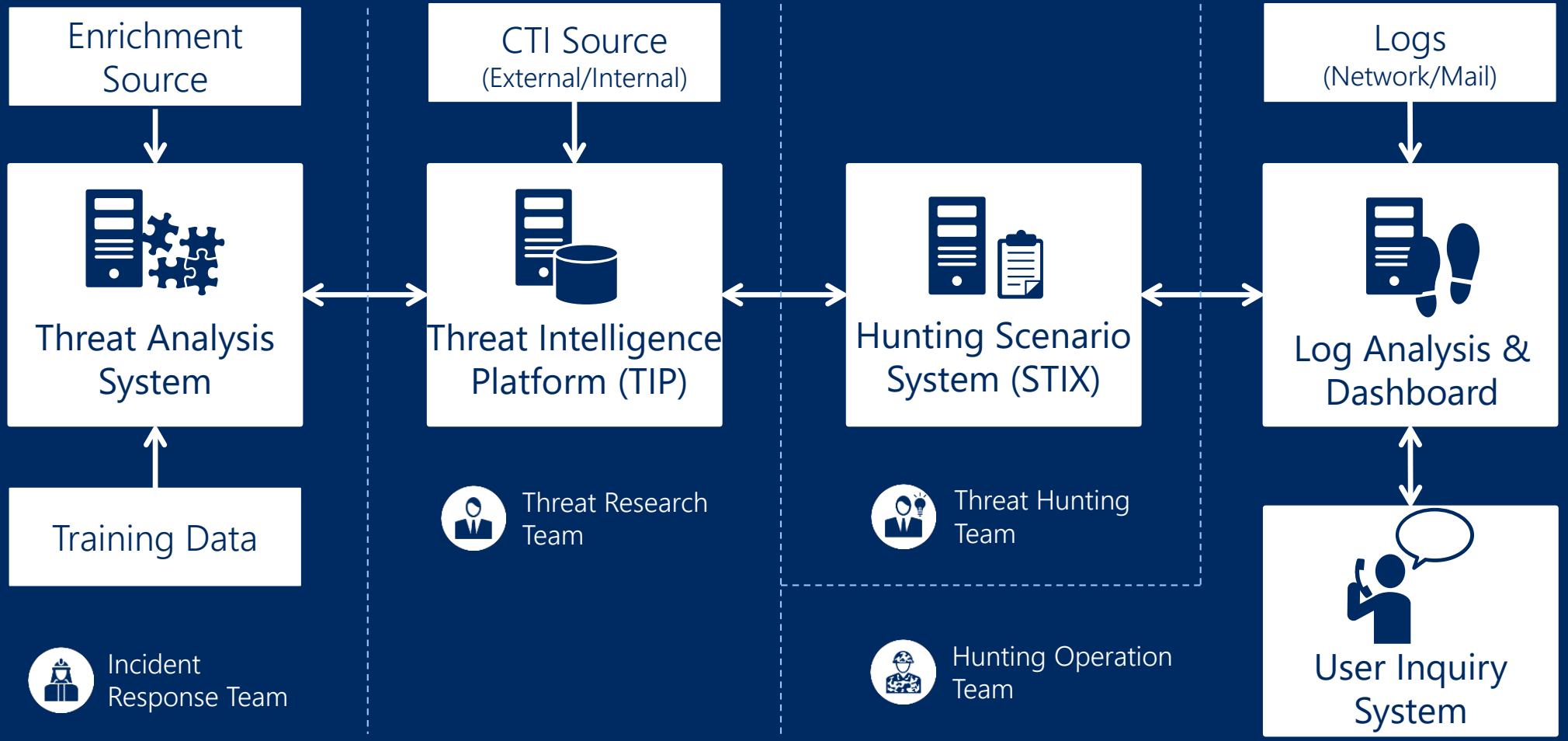

Threat Hunting
Operations
At Scale

Threat Hunting Operations

Tools for Support Threat Hunting Operations

Threat Hunting Team	Asset, Internal System, Directory DB	Internal CTI (Observed & Analysis) DB	Hunting Scenario System (STIX)
Hunting Operation Team	Log Analysis & Dashboard	EDR / NCSP	User Inquiry System
Incident Response Team	Forensic Tool	Log Management	Threat Intelligence Platform (TIP)	Threat Analysis System

Threat Hunting System Architecture Overview




Threat Hunting
Operations
Framework

Values of Hunting Operations

1

Look for uncovered threat or ongoing threat that evade existing security solutions, and mitigate and remediate it as soon as possible.

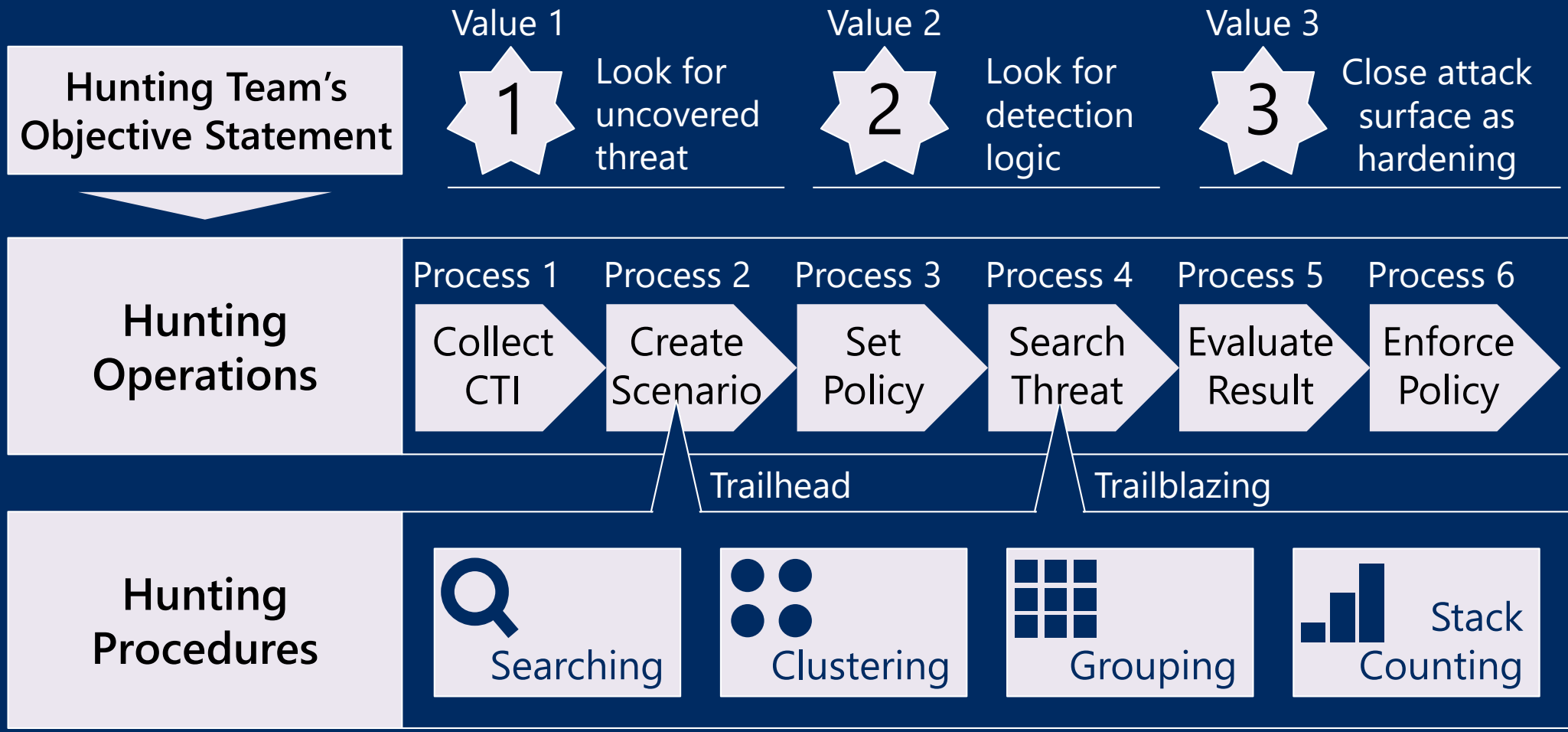
2

Look for logic such as signature, detection rule to detect uncovered threat, and apply to existing security solutions to close detection gaps.

3

Close attack surface as part of hardening activities to enhance current security posture together with Red team.

Threat Hunting Operations Framework

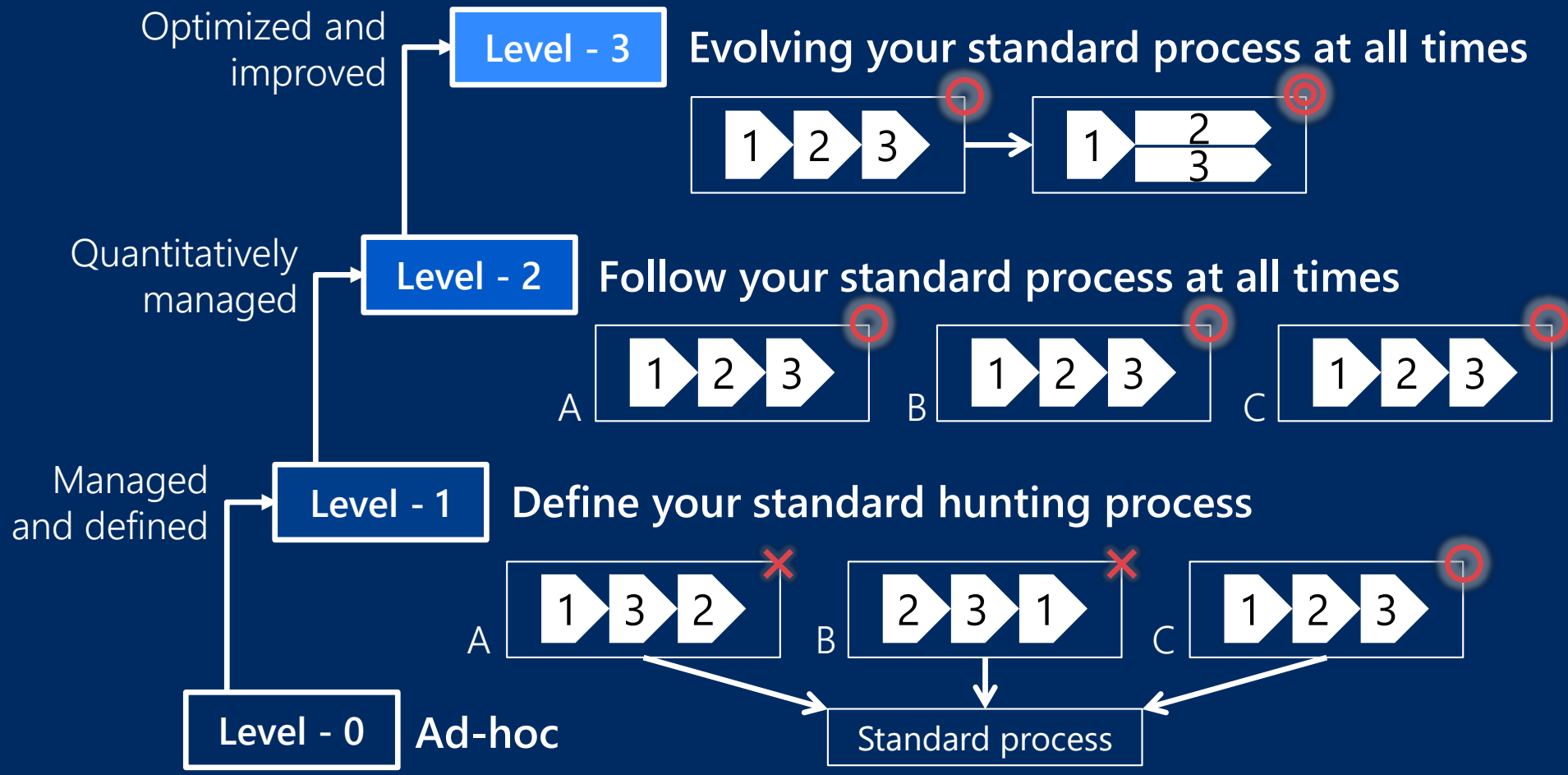


KAIZEN, again

"The right process will produce the right results."

TOYOTA WAY

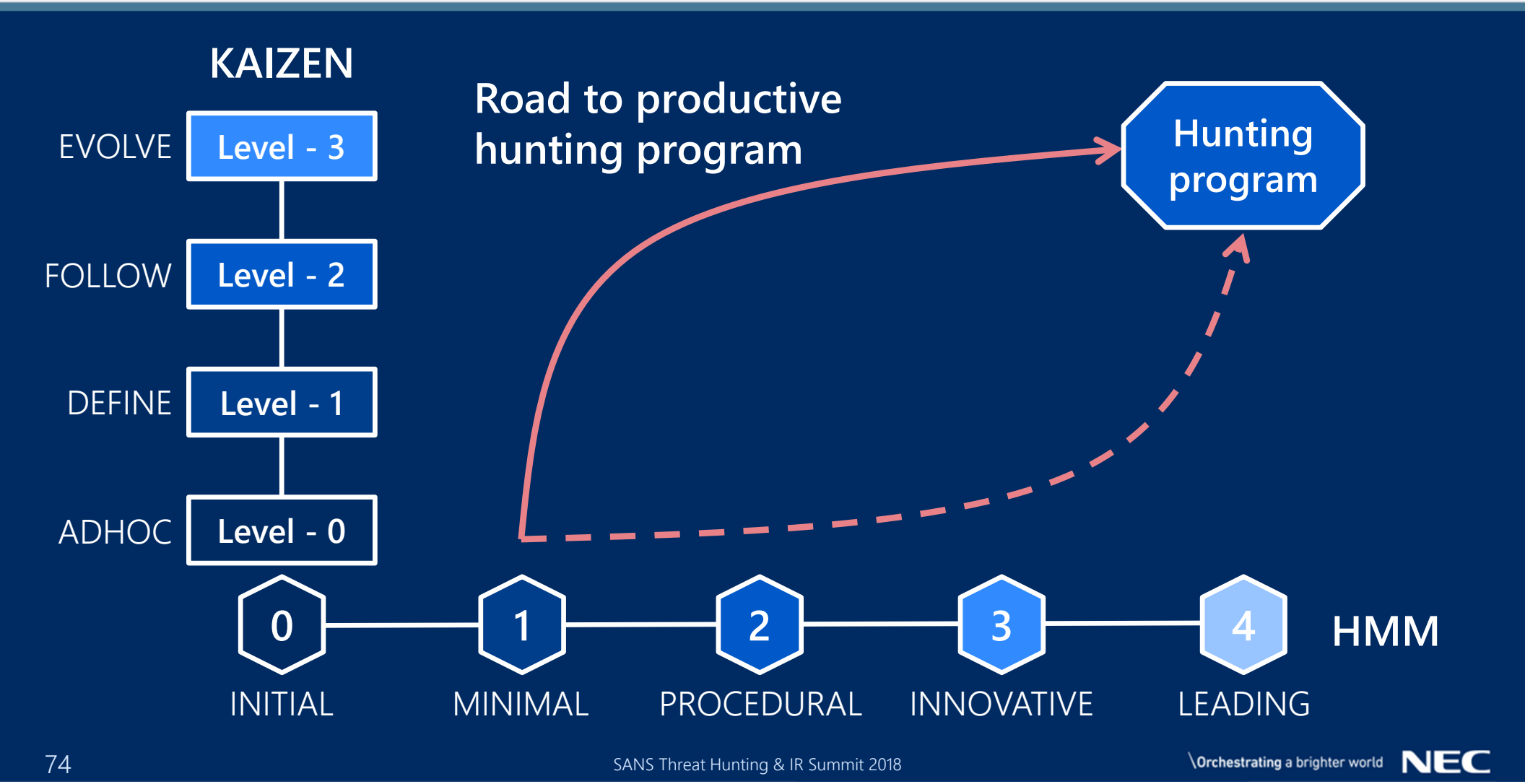
Hunting Process KAIZEN Model



To improve productivity of hunting program

1. **Define your hunting process according to objectives where hunting team would produce the right results.**
   - Give priority to accomplish the process than making use of difficult hunting techniques you cannot handle.
   - Choose hunting techniques and tools which support the hunting process.
2. **Improve the process first based on KAIZEN**
   - Communication and KAIZEN culture are key to success.

HMM and KAIZEN



https://www.linkedin.com/company/threathunting

https://www.twitter.com/threathunting_

Conclusion

"A good hunter plays where the threat is. A great hunter plays where the threat is going to be."

Thanks to

- Naoki Sasamura (NEC-CSIRT)
- Takeo Tagami (NEC-CSIRT)
- Yoshihiro Oshibuchi (NEC)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