computer emergency response team | CERT-EU for the EU institutions, bodies and agencies

Real World Information Exchange Challenges and Insights

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computer emergency response team | CERT-EU for the EU institutions, bodies and agencies

About us

- EU Institutions' own CERT
- Operational support for the internal IT teams
- Supports 60+ entities
- Defense against targeted cyber threats

Constituents

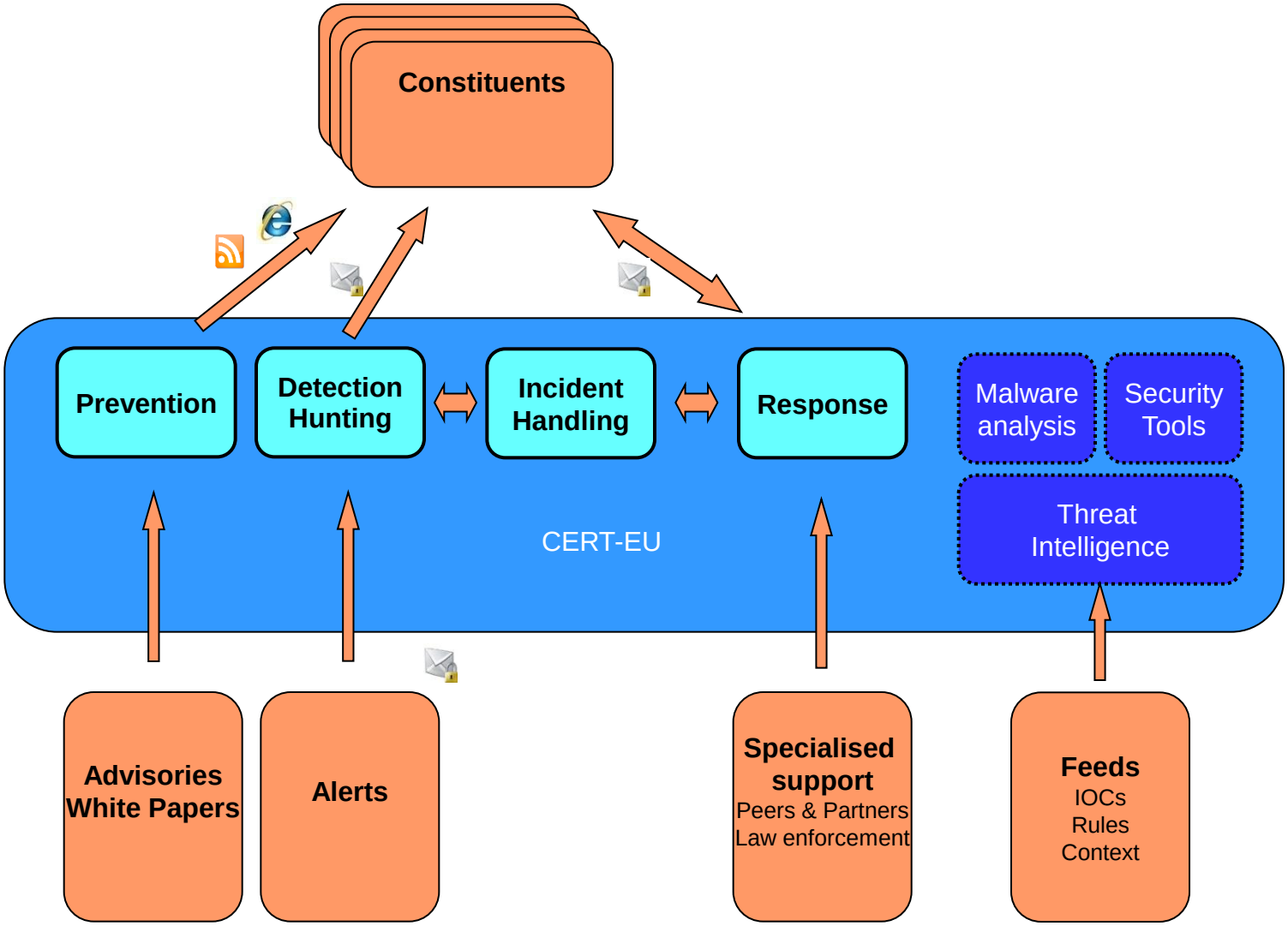
- Around 60 organisations
- From 40 – 40.000 users
- Seperate, heterogenous networks
- Cross-sectoral
  - Government, foreign policy, embassies
  - Banking, energy, pharmaceutical, chemical, food, telecom
  - Maritime, rail and aviation safety
  - Law enforcement (EUROPOL, FRONTEX, EUPOL) and justice
  - Research, hi-tech, satellite navigation (GALILEO), defence (EUMS, EDA)
- High-value targets






Peers - Partners

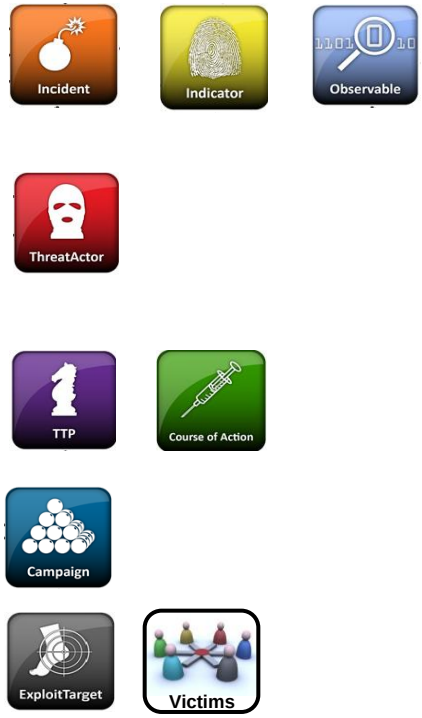
Services


Constituents
Prevention
Detection Hunting
Incident Handling
Response
Malware analysis
Security Tools
Threat Intelligence
CERT-EU
Advisories White Papers
Alerts
Specialised support
Peers & Partners
Law enforcement
Feeds
IOCs
Rules
Context

Threat Intelligence

Key questions

- What?
- Who?
- Why?
- How?
- When?
- Where?



Risk management

- Intelligence needs to serve a purpose
- Not all risks are equal
- Situation is not static

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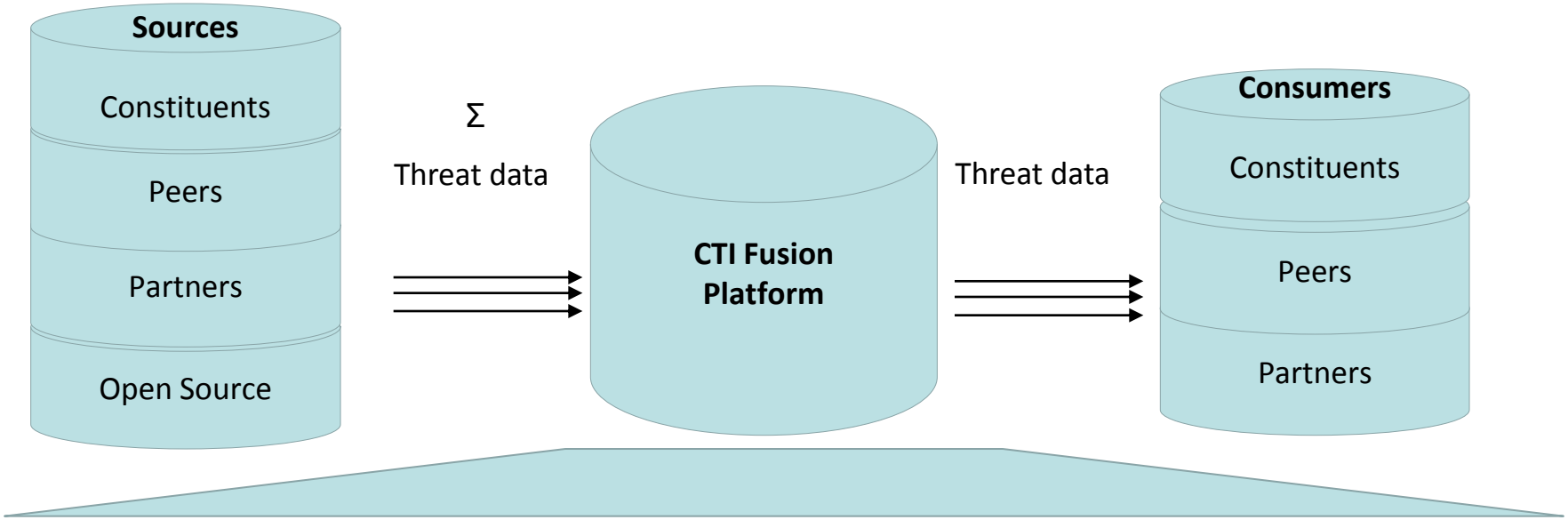
Let's Gather All Badness



Technical intelligence

Data flow oriented

- ✓ **IOCs**
  - Raw value
  - Types
- ✓ **Accuracy**
  - FP / TP feedback
  - Checks
  - Time-To-Live
- ✓ **Context**
  - Timing
  - Sighting
  - Killchain
- ✓ **Detection mechanisms**
  - YARA
  - SNORT

Tactical intelligence

Knowledge Basis oriented

- ✓ **5 Motives**
  - Cyber-Crime
  - Cyber-War
  - Cyber-Espionage
  - Hacktivism
  - Jihadism
- ✓ Country
- ✓ Type
- ✓ Activities
- ✓ First seen / Last seen

- ✓ **6 Categories**
  - Malware (families)
  - Exploits
  - Tools
  - Infrastructures
  - Attack Patterns (S) & (G)
- ✓ Intended Effect
- ✓ Kill Chain
- ✓ First seen / Last seen

- ✓ **3 Classes**
  - Surveillance
  - Operations
  - Cases
- ✓ Targeted Domains
- ✓ Targeted Sectors
- ✓ Time Period
- ✓ Intent
- ✓ First seen / Last seen

STIX – TTP Data Model

STIX – TTP Data Model		CERT-EU – TTP Implementation
ID		YES
TIMING		YES (First Seen / Last Seen)
TITLE / DESCRIPTION		YES
INTENDED EFFECT		YES
BEHAVIOR	**ATTACK PATTERNS**	**(Generic) – KB1**
		(Specific) – KB2
	MALWARE	**KB3**
	EXPLOITS	**KB4**
RESOURCES	**TOOLS**	**KB5**
	INFRASTRUCTURES	**KB6**
	PERSONAS	Not used
VICTIM TARGETING	IDENTITY	YES (Org / Country / Sector level not structured yet)
	TARGETED SYSTEM	Not used
	TARGETED INFO	Not used
	TARGETED TECH DETAILS	Not used
EXPLOIT TARGETS		Not used
RELATED TTPs		YES
KILL CHAIN		YES
INFORMATION SOURCE		YES

TTP Knowledge Bases

KB1 - Attack Patterns (G)

Web Appl. Scanning, Social Media Intell Collection, Malicious Office docs, Phishing, SWC, Spoofed Websites, DoS, Defacement, Doxing, etc

- Common techniques used by attackers
- Only for trends / basic profiling
- Useless for attribution

Started: November 2015
Entries: 10+

KB2 - Attack Patterns (S)

Malicious Tor exit nodes, DGA, Single hit, trojanised software (TrueCrypt), stalling code, COM object hijacking, desktop shortcuts redirection, satellite links hikjacking, etc

- Special techniques not accessible to any attacker
- May be used for attribution and characterisation of malware.

Started: mid 2015
Entries: 30+

KB3 - Malware

RAT / backdoor (BlackEnergy, PlugX, njRAT, Snake, Sofacy, xxxDuke, …), ransomware/ banking trojan (TeslaCrypt, CryptoWall, GPCode, Dridex, Shifu, Dyre, …), etc

- Malware family level
- Focus on malware used in targeted attacks
- Importance of Detection Mechanisms

Started: mid 2013
Entries: 600+

KB4 - Exploits

Exploit Kits, CVE (?)

- Symmetrical to CVE / Exploit Target ?

Started: Jan 2016
Entries: 30+

KB5 - Tools

Legitimate tools re-purposed or customised for malicious use: Shell, port scanners, web vulnerability scanners, sql injection tools, key loggers, password cracking etc,.

- Understanding TTP supply chain

Started: Nov 2015
Entries: 60+

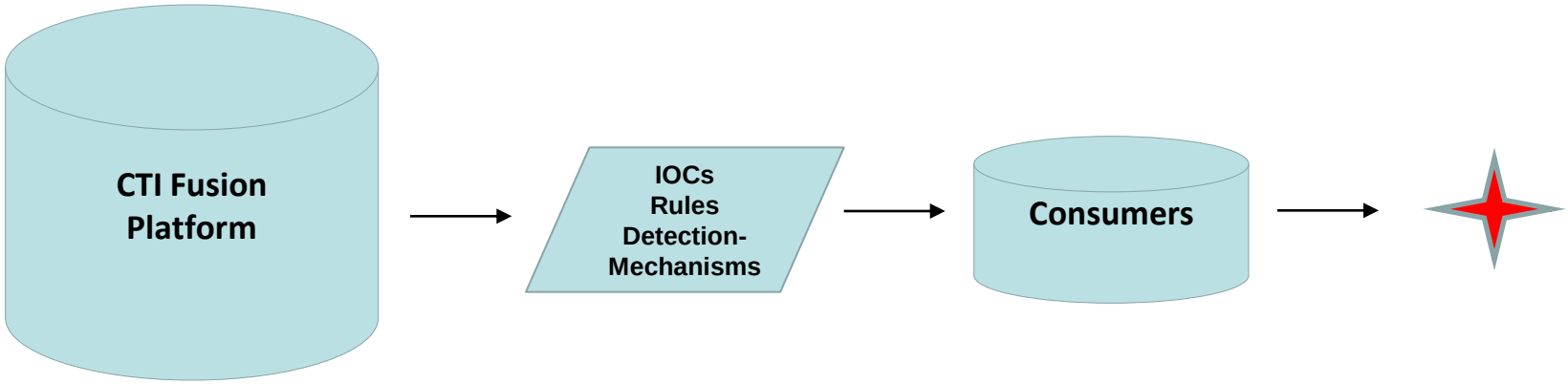
KB6 - Infrastructures

Delivery infra (phishing, watering hole, etc), C2 infra, bots, forums, malware sites, darknets, etc

- Pivoting for attribution

Started: Nov 2015
Entries: 30+

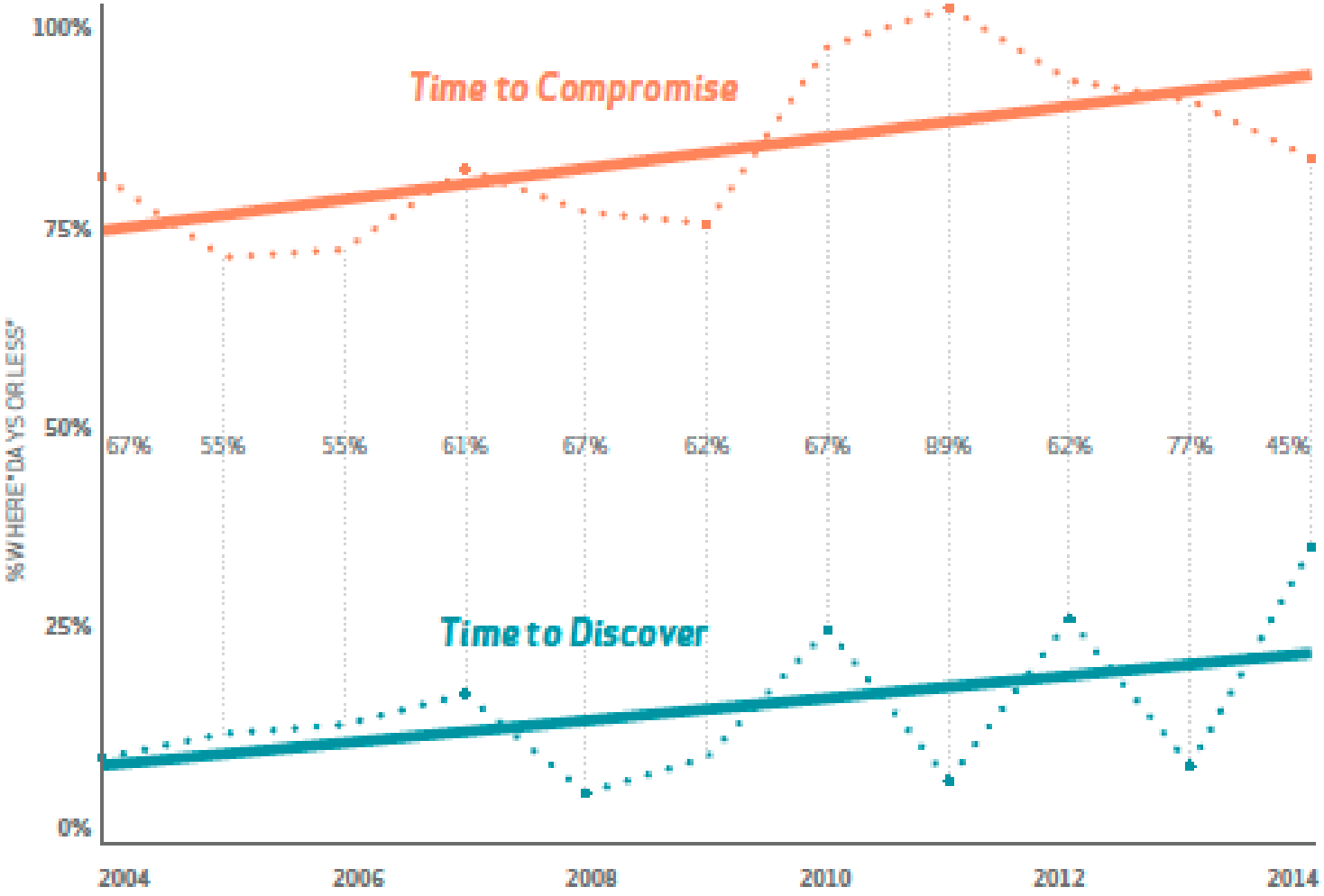
Let's Use it to Detect Stuff



DBIR 2015

- 60% of attacks don't use malware
- 3% overlap of indicators
- Most indicators have a lifetime of only 1 day
- 60% of organisations compromised within minutes
- Very few breaches are detected using IOCs

Race



2015 Verizon DBIR

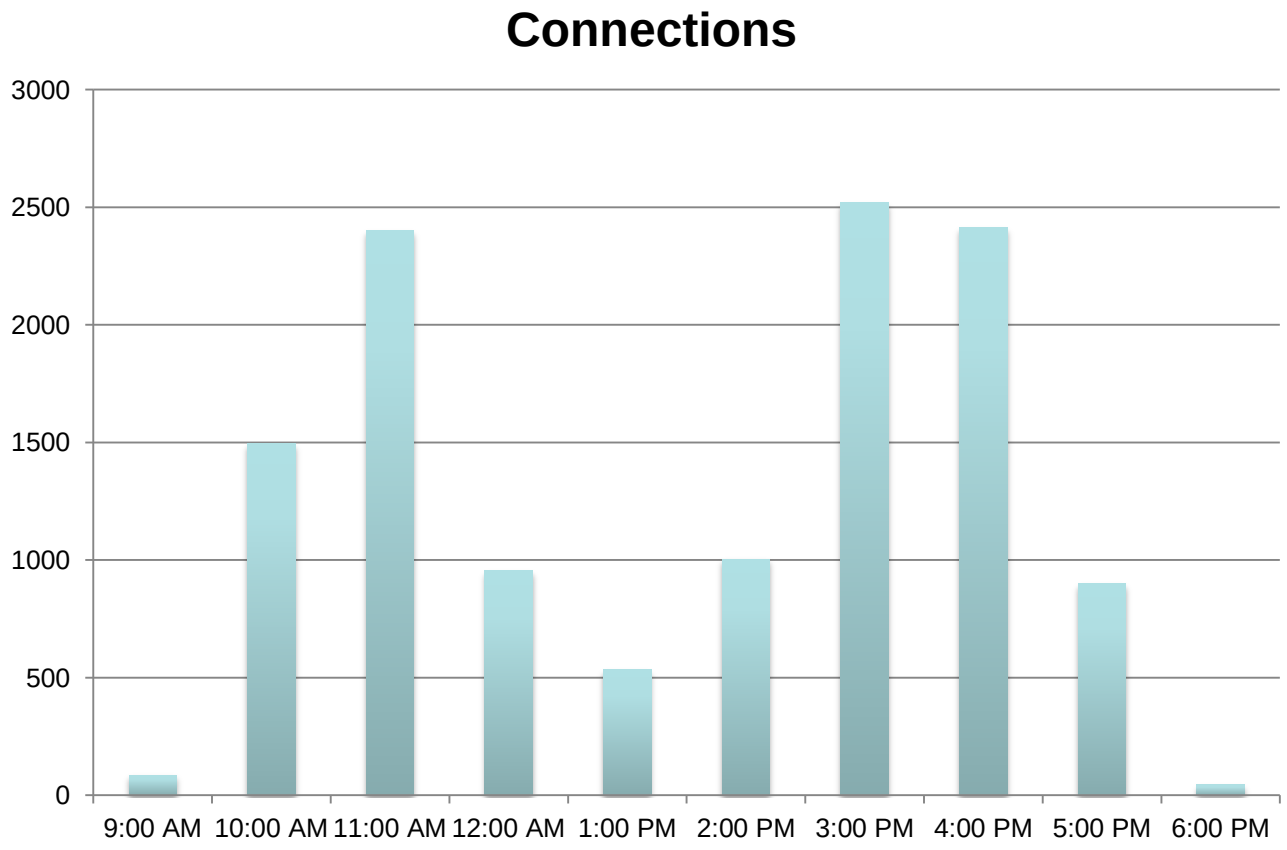
Typical Challenges

- Technical indicators of compromise very short-lived
  - Domains: Very high number of domains, freshly registered
  - IPs: Changing: active, parking, legit
  - MD5: Victim-specific signatures
  - Email metadata: changing on a daily basis
- Blending in with the user
  - User agent
  - Proxy credentials
  - Legitimate accounts (also admins)
  - Timing / batch processing
  - Legitimate domains as C&C

Ke3Chang

	Teleramafr.com	Lemondebe.org	istafrica2013	belgiquede.com	belgabe.com
26-Apr-13	198.100.113.60				
26-Apr-13	None				
8-May-13	198.100.113.60				
14-May-13			193.43.125.242		
20-May-13	65.55.57.21		65.55.57.29		
21-May-13				192.69.237.25	
30-May-13	192.69.237.25	216.158.76.216	216.158.76.216	93.46.8.89	142.4.40.230
12-Jun-13	193.191.245.4	68.232.45.233	193.43.125.242		93.94.105.162
6-Jul-13	108.62.206.68		108.62.206.68		
19-Jul-13	193.43.125.242		193.43.125.242		
31-Jul-13				122.10.83.51	
25-Aug-13		198.100.114.14			
6-Sep-13		122.10.83.51			
30-Sep-13		103.246.244.196		103.246.244.196	103.246.244.196
24-Oct-13					93.94.105.162
14-Dec-13		203.84.187.111		62.116.182.44	
30-Dec-13	None		None		
18-Mar-14				192.69.236.176	
31-Mar-14	137.175.36.18	137.175.36.18	137.175.36.18	137.175.36.18	137.175.36.18
28-Apr-14		50.118.255.47		50.118.255.47	
14-May-14	65.19.157.196		65.19.157.196		
19-May-14		69.46.84.51			
22-May-14		None			
3-Jun-13		50.117.115.84			
15-Jun-14		None			None
27-Jun-14	None		None	59.24.3.173	
21-Jul-14				50.118.255.47	
2-Aug-14				173.193.106.11	
1-Feb-15	For sale	Sinkholed	For sale	192.199.250.138	For sale

C&C Communications



Snake

May 2014

Sept 2015

Nov 2015

Collection Challenge

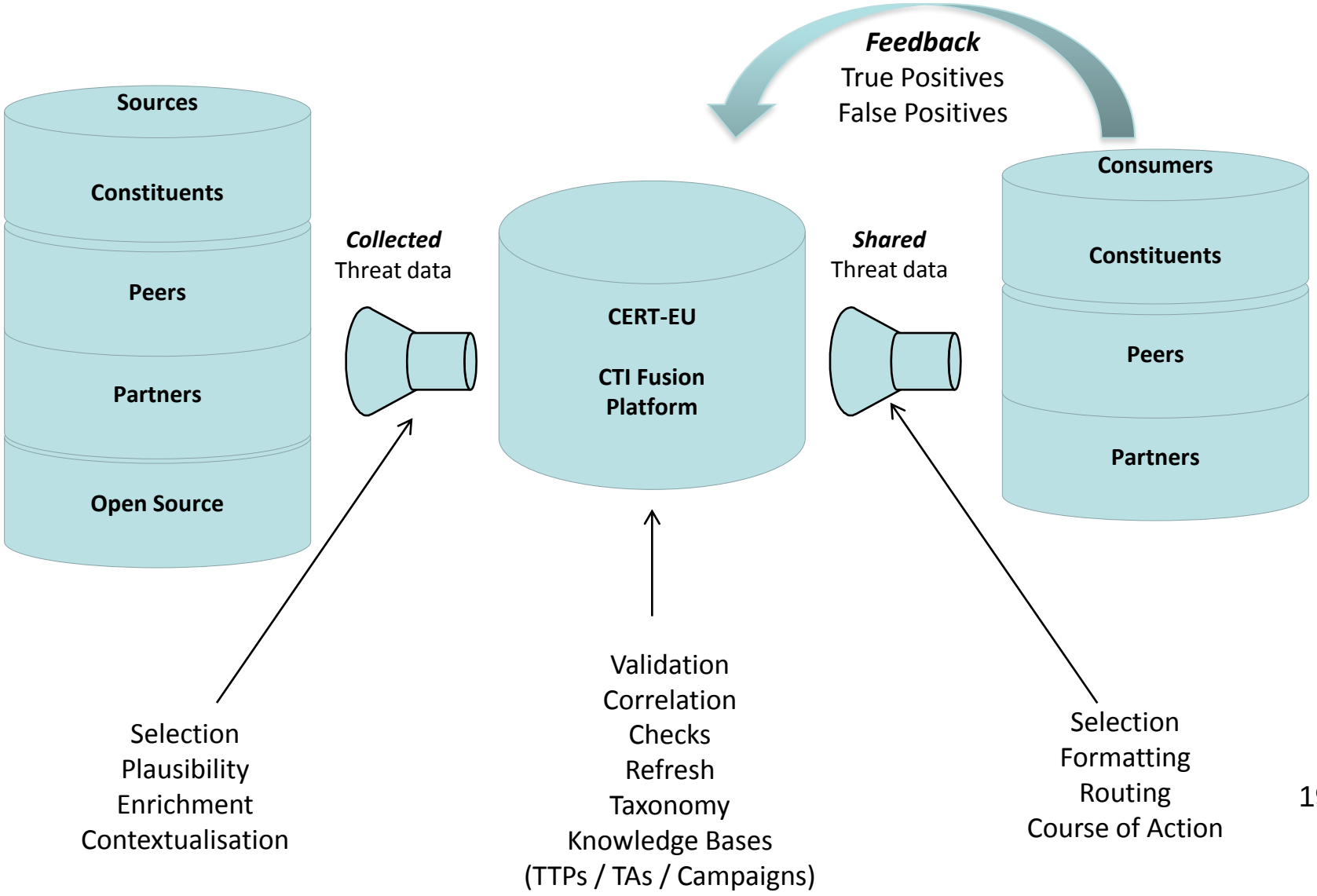
- Large diversity of information sources
- Formatted, unformatted, PDF
- Massive overload of information
- Overwelming amount of irrelevant information
- Accuracy not guaranteed
- Unclear timing
- Unclear sighting or targeting
- Large number of false positives
- Difficult prioritisation
- **Drowning the real positives**

Constituent Perspective

- Limited human resources
- Specific IT security tools
- Limited capacity for the implementation of detection rules
- Specific security policies

- Automation / Routing
- Minimise false-positives (in fact they prefer no positives…)
- Prioritisation on alerts
- Actionable context when needed

Workflow


Feedback
True Positives
False Positives
Sources
Constituents
Peers
Partners
Open Source
Collected
Threat data
CERT-EU
CTI Fusion Platform
Shared
Threat data
Consumers
Constituents
Peers
Partners
Selection
Plausibility
Enrichment
Contextualisation
Validation
Correlation
Checks
Refresh
Taxonomy
Knowledge Bases
(TTPs / TAs / Campaigns)
Selection
Formatting
Routing
Course of Action

Input Handling

Technical checks (automated)

- Constituent & Partners ranges
- TLD/SLD check
- Alexa ranking
- YARA validator

Source

- Reliability
- Redundancy

Risk

- Targeting / promixity
- Threat level

Contextualisation

- Timing
- Targeting
- Kill chain

Correlations

- Provided
- Detected
- Researched

Contextualisation

Minimal Context : Poor

```
csdns.com  Domain
cs.com     Domain
-analytics.dynaliacs.com     Domain
lash.js    URL
.48.222    IP Address
.51.43     IP Address
41.175     IP Address
8.196      IP Address
mg.ca      Domain
g.ca Domain
mg.ca      Domain
yimg.ca    Domain
mg.ca      Domain
rg.tw      Domain
yimg.ca    Domain
exru.com   Domain
yandexru.com     Domain
124.56     IP Address
55.122     IP Address
120.16     IP Address
rivacy_security.htm    URL
n/news/dochunter.asp?hostid= URL
stid=      URL
line.asp?hostname=     URL
48.125     IP Address
216.124    IP Address
```

Contextualisation

Timing	✘
Detect_date	
First seen	
Last seen	
KillChain	✘
Targeting	✘
Geoloc	
Sector	

- Block traffic to the following domains:
  - arabooks.ch
  - artas.org
  - tsoftonline.com
  - www.eamtm.com
  - news.grouptumbler.com
- Block traffic to the following IPs:
  - 200.63.46.23
  - 194.38.160.153
  - 95.128.72.24
  - 72.34.47.186
  - 188.40.99.143
  - 85.95.236.114

Contextualisation

Timing	✘
Detect_date	
First seen	
Last seen	
KillChain	✘
Targeting	✘
Geoloc	
Sector	

Minimal Context : Better

Exploit files

First seen (YYYY-MM-DD)	Filename	SHA1	Size
2013-11-04	-	353540c6619f2bba2351babad736599811d3392e	946124
2014-03-20	nota.pdf	5295b09592d5a651ca3f748f0e6401bd48fe7bda	917093
2014-03-14	dip.mail march.pdf	c671786abd87d214a28d136b6bafd4e33ee66951	919914
2014-03-11	Bulletin-PISM-No-31-(625)-March-10-2014.pdf	65681390d203871e9c21c68075dbf38944e782e8	917093
2014-03-05	March.pdf	8949c1d82dda5c2ead0a73b532c4b2e1fbb58a0e	908285
2013-07-01	paper_format.pdf	74bc93107b1bbae2d98fca6d819c2f0bbe8c9f8a	917093

Droppers

First seen (YYYY-MM-DD)	Filename	SHA1	Compiled (All times in UTC)	Size
2014-04-27	rcs.DSC_1365527283.jpg	f621ec1b363e13dd60474fcfab374b8570ede4de	Fri Aug 2 10:50:12 2013	430080
2014-03-18	rcs.18.jpg	7631f1db92e61504596790057ce674ee90570755	Fri Aug 2 10:50:12 2013	811008
2014-03-13	rcs.Ukraine-Gas-Pipelines-Security-Report-March-2014.pdf	5a199a75411047903b7ba7851bf705ec545f6da9	Fri Aug 2 10:50:12 2013	942080
2013-11-11	rcs.Заказ.doc	0e5f55676e01d8e41d77cdc43489da8381b68086	Fri Aug 2 10:50:12 2013	405504

Contextualisation

Timing	✓
Detect_date	
First seen	✓
Last seen	
KillChain	✓
Targeting	✗
Geoloc	
Sector	

Minimal Context : Better

SECURELIST THREATS CATEGORIES TAGS

The Banking Trojan Emotet: Detailed Analysis

By Alexey Shulmin on April 9, 2015. 2:00 pm

hxxp://88.80.187.139
hxxp://188.93.174.136
hxxp://130.133.3.7

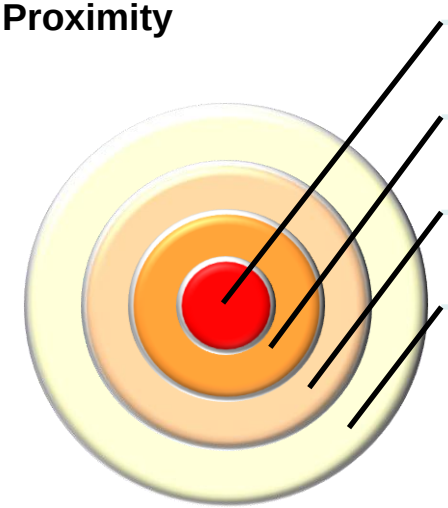
Contextualisation

Timing	✓
Detect_date	
First seen	✓
Last seen	✓
KillChain	✓
Targeting	✗
Geoloc	
Sector	

Resolve	First	Last	Source
crl.microsoft.com	2014-10-21 12:11:00	2015-07-21 10:54:00	kaspersky
ardownload.adobe.com	2014-10-19 23:10:00	2015-07-21 10:46:00	kaspersky
fbexternal-a.akamaihd.net	2014-10-21 15:16:00	2015-07-21 10:22:00	kaspersky

Proximity / Threat Level

Proximity



EU-I – Targeting constituents

EU-Centric – Targeting EU Member States

EU Nearby - Targeting close partners (e.g. NATO, USA)

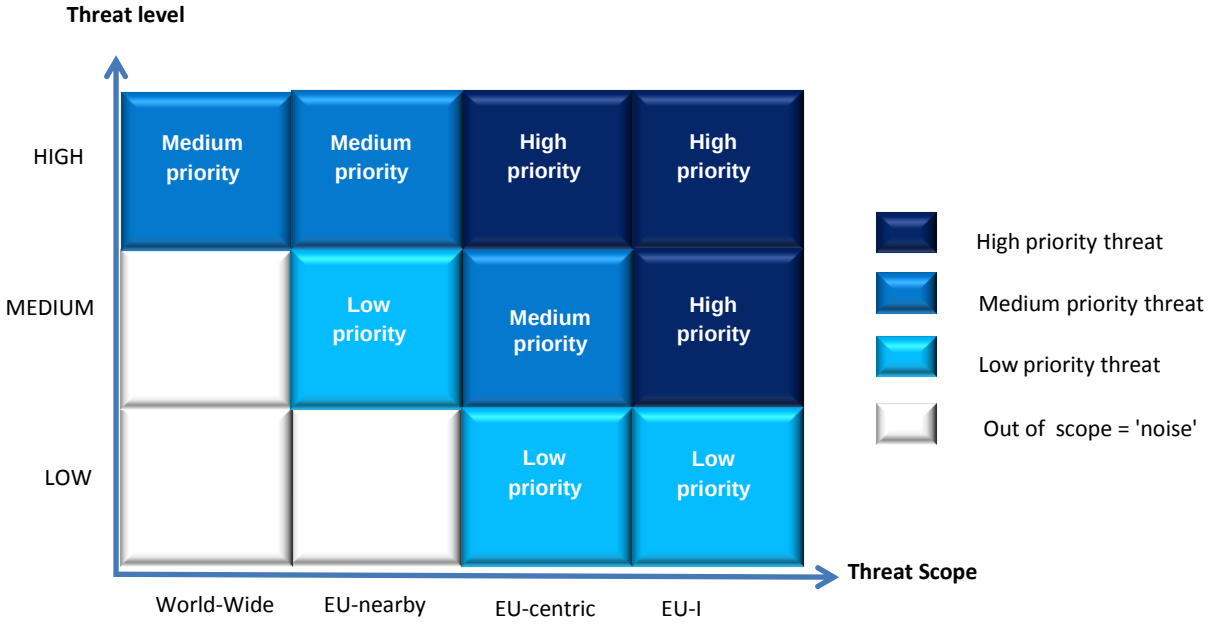
World-Class - EU-I might be 'opportunity' or 'collateral' victims of major world-wide threats

Threat Level

High
Very sophisticated APT

Medium
Targeted, unsophisticated

Low
Non-targeted attack / malware



Extended Context – Example 1

SECURELIST THREATS ▾ CATEGORIES ▾ TAGS ▾ ENCYCLOPEDIA

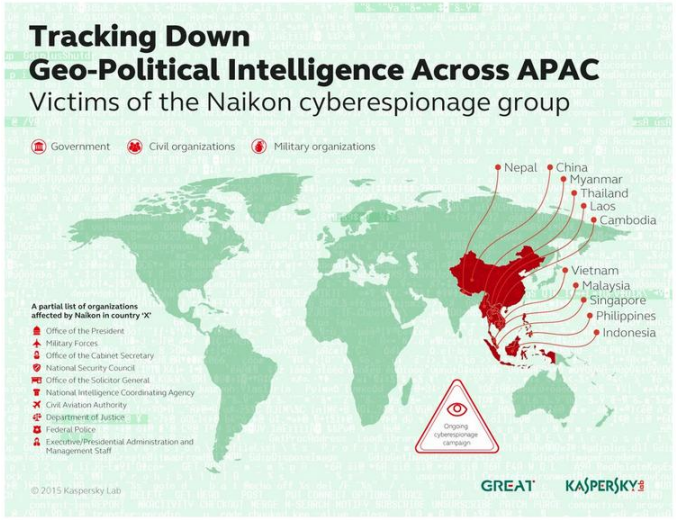
The Naikon APT

Tracking Down Geo-Political Intelligence Across APAC, One Nation at a Time

Our recent report, "The Chronicles of the Hellsing APT: the Empire Strikes Back" began with an introduction to the Naikon APT, describing it as "One of the most active APTs in Asia, especially around the South China Sea". Naikon was mentioned because of its role in what turned out to be a unique and surprising story about payback. It was a Naikon attack on a Hellsing-related organization that first introduced us to the Hellsing APT. Considering the volume of Naikon activity observed and its relentless, repeated attack attempts, such a confrontation was worth looking into, so we did.

> The #NaikonAPT group was spear-phished by an actor we now call "Hellsing"

Tweet



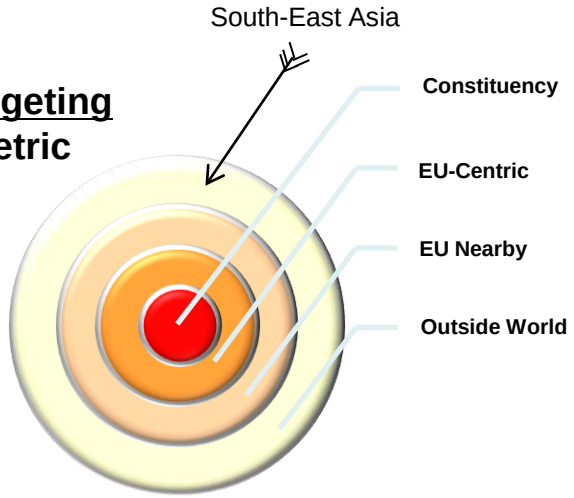
Below is a partial list of organizations affected by Naikon's "operator X's" espionage campaign in country X.

- Office of the President
- Military Forces
- Office of the Cabinet Secretary
- National Security Council
- Office of the Solicitor General
- Intelligence Services
- Civil Aviation Authority
- Department of Justice
- Federal Police
- Executive/Presidential Administration and Management Staff

WHO - Threat name
→ Threat Actor

WHAT - Campaign
→ Cyber Espionage

WHERE - Geographical targeting
→ **1st Threat Proximity Metric**



WHERE - Sectoral targeting
→ **2nd Threat Proximity Metric**

Extended Context – Example 1

Payload

The main module is a remote administration utility. Using SSL, the module establishes a reverse connection to the C&C server as follows: it sets up an outgoing connection to the C&C server and checks if there is a command that it should execute. If there is, it executes the command and returns the result to the C&C. There are 48 commands in the module's repertoire, which a remote operator can use to effectively control the victim computer. This includes taking a complete inventory, downloading and uploading data, installing add-on modules, or working with the command line.

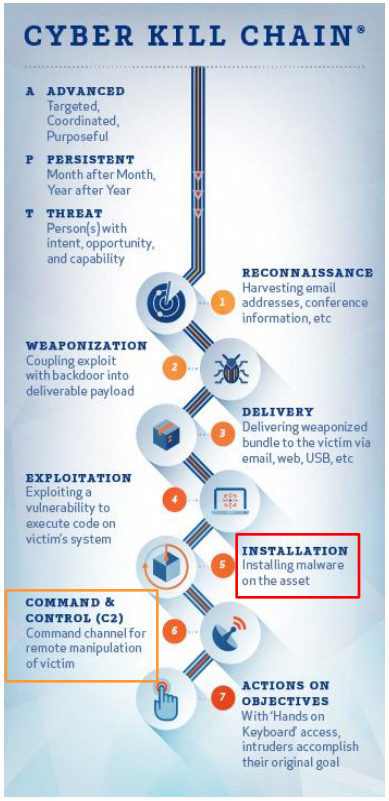
d085ba82824c1e61e93e113a705b8e9a	118272	Aug 23 18:46:57 2012
b4a8dc9eb26e727eafb6c8477963829c	140800	May 20 11:56:38 2013
172fd9cce78de38d8cbcad605e3d6675	118784	Jun 13 12:14:40 2013
d74a7e7a4de0da503472f1f051b68745	190464	Aug 19 05:30:12 2013
93e84075bef7a11832d9c5aa70135dc6	154624	Jan 07 04:39:43 2014

Command & Control

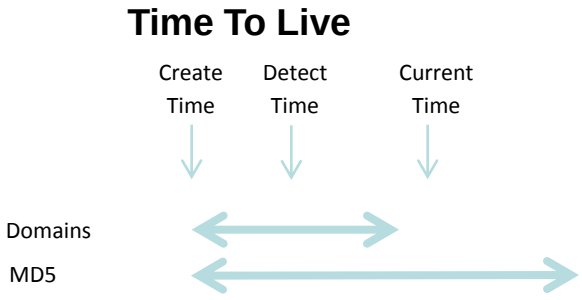
Here is a partial list of C&C servers and victim locations, demonstrating the geo-specific correlation:

ID	Jakarta	linda.googlenow.in
ID	Jakarta	admin0805.gnway.net
ID	Jakarta	free.googlenow.in
ID		frankhere.oicp.net
ID	Bandung	frankhere.oicp.net
ID	Bandung	telcom.dhtu.info
ID	Jakarta	laotel08.vicp.net
JP	Tokyo	greensky27.vicp.net
KH		googlemm.vicp.net
KH	Phnom Penh	googlemm.vicp.net
MM		peacesyou.imwork.net
MM		sayakyaw.xicp.net
MM		ubaoyouxiang.gicp.net
MM	Yangon	htkg009.gicp.net

HOW – TTP & Kill Chain



WHEN – Timing



Contextualisation

Timing	✓
Detect_date	✓
Start_date	✓
End_date	N/A
KillChain	✓
Targeting	✓
Geoloc	✓
Sector	✓

Extended Context – Example 2

FireEye

FireEye Intelligence Exchange Alert

The Teenage Mutant Malvertiser Network

By J.Gomez | FireEye Labs

Since early 2015 FireEye Labs has observed a highly active malvertising operation involving Bedep ad fraud activity and malicious redirection to Exploit Kits via a multitude of advertising and search affiliated domains. Among the exploit kits being redirected to are well known names like Angler, Magnitude, Nuclear and Rig, each redirection to an EK sharing a common link. We believe this particular operation has been active since at least mid 2014, if not prior, and is still very active at time of this writing.

...

by the "click2." prefixed sub domains alone.

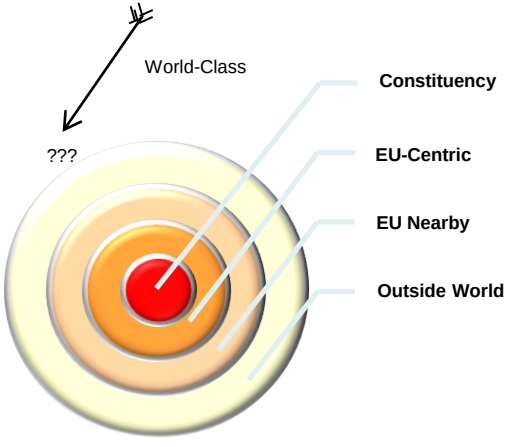
Some of the most active destination (or cushion servers as they are commonly referred to) domains leading to EK's include but are not limited to the following, as you will notice some domains redirect to more than one EK.

Angler	Magnitude	Nuclear	Rig / Other
ads.fsrinc.biz	click2.systemaffiliate.com	click2.systemaffiliate.com	click2.systemaffiliate.com
hit.buy-targeted-traffic.com	click2.danarimedia.com	news4news015.com	buyadvertsort.com
bbwlesbians.xblog.in	ado-global.com	news4news14.com	buyadvertview.com
find-everything.info	ads.fsrinc.biz	news4news15.com	buyadvlist.com
litle-finder.me	click.upperseeker.com	news4news2014.com	dealsadvdeals.com
megafinder24.info	death-tostock.com	news4news2015.com	dealsadvdeals.com
searchl.org	find-all.biz		dealsadvdeals.com
searchwebfind.org	find-everything.info		buyadvertview.com
truesearchresults.com	global-search24.biz		
webwebfind.com	integrosearch.com		
news4news015.com	litle-finder.me		
news4news14.com	megafinder24.info		
news4news15.com	millsearch.net		
news4news2014.com	searchl.org		
news4news2015.com	searchwebfind.org		
	superior-movies.com		
	truesearchresults.com		
	webwebfind.com		

HOW – TTP & Kill Chain

WHEN

WHERE ?



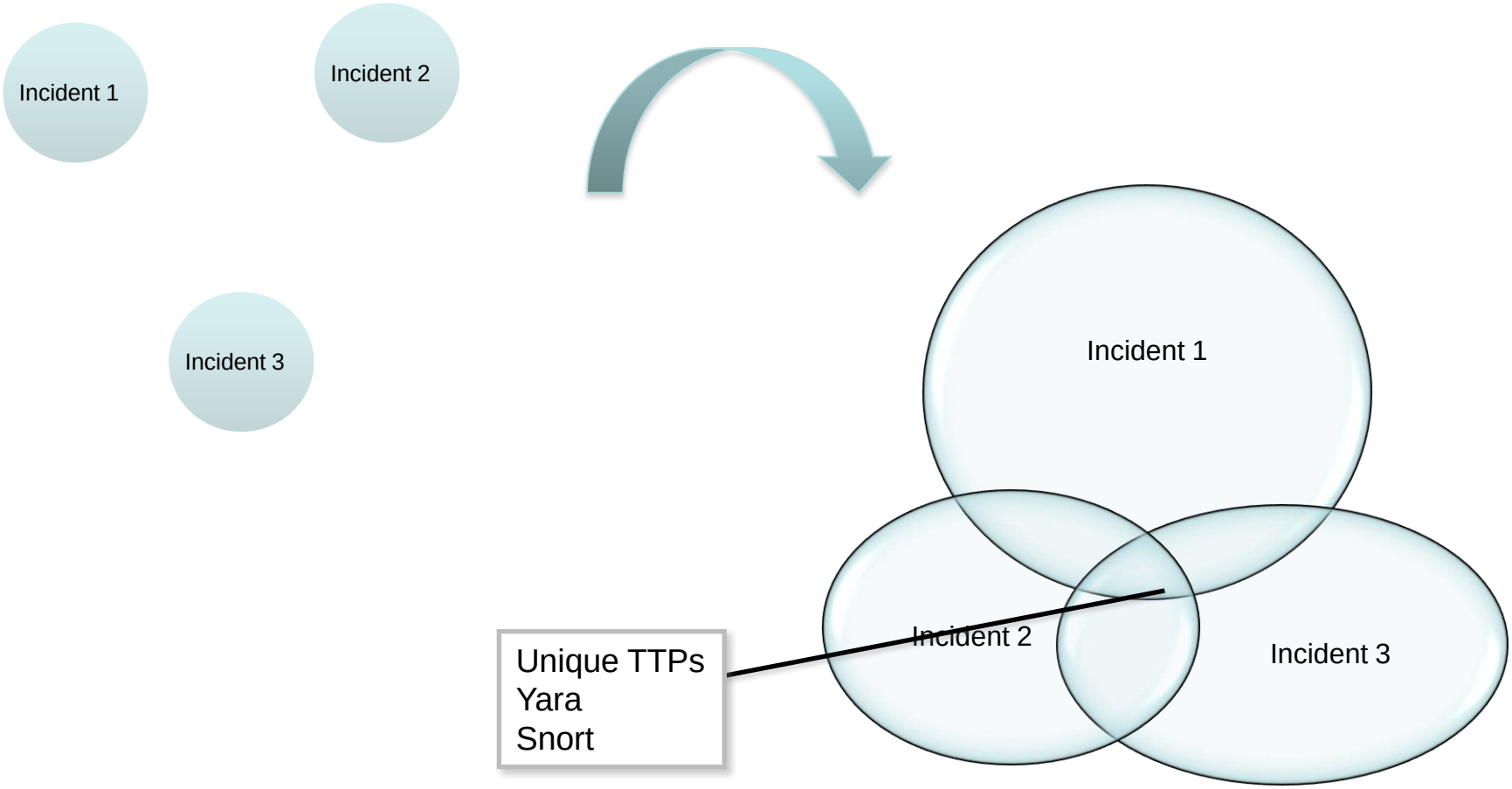
Contextualisation

Timing	✘
Detect_date	
Start_date	
End_date	N/A
KillChain	✓
Targeting	✘
Geoloc	
Sector	

Success Factors for Enrichment

- Taxonomy
- Correlation
  - Previous incidents in the constituency
  - Previous reports
  - Intensity
  - TTPs / Actors / Campaigns
- Unique TTPs
  - Behaviour
  - Unique patterns
  - Effective detection rules

Pivoting via TTP



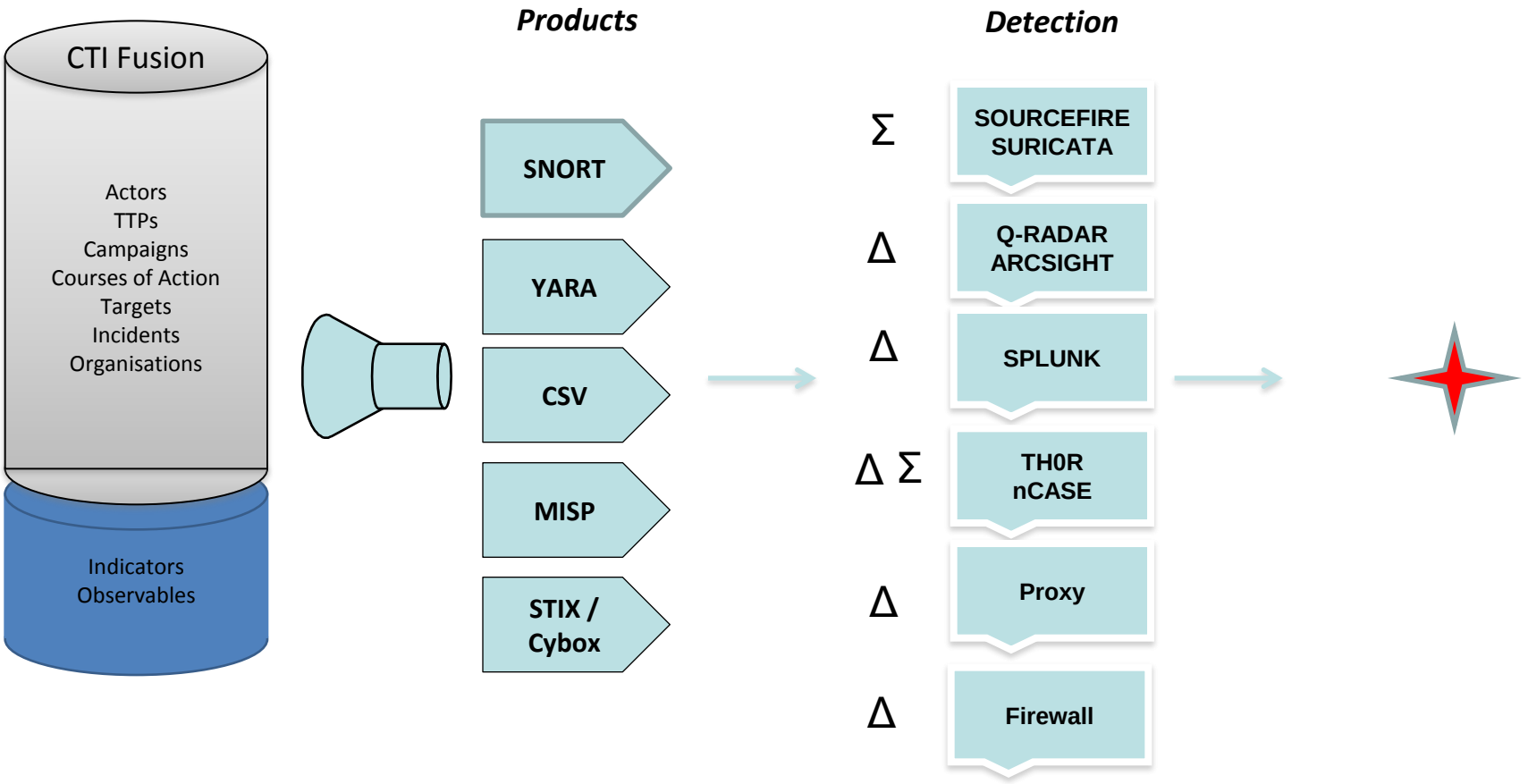
Success Factors for Output

- Adapting the product to the audience
  - Drawing from the intell and context
  - Adapting content and format
  - Timing
- Routing / Course of Action
  - What to do (prevent, detect, block, hunt)
  - How
- Respect the sharing limitations (TLP)
- Anonymisation (sources / victims)
- Automation when possible
- Escalation when needed

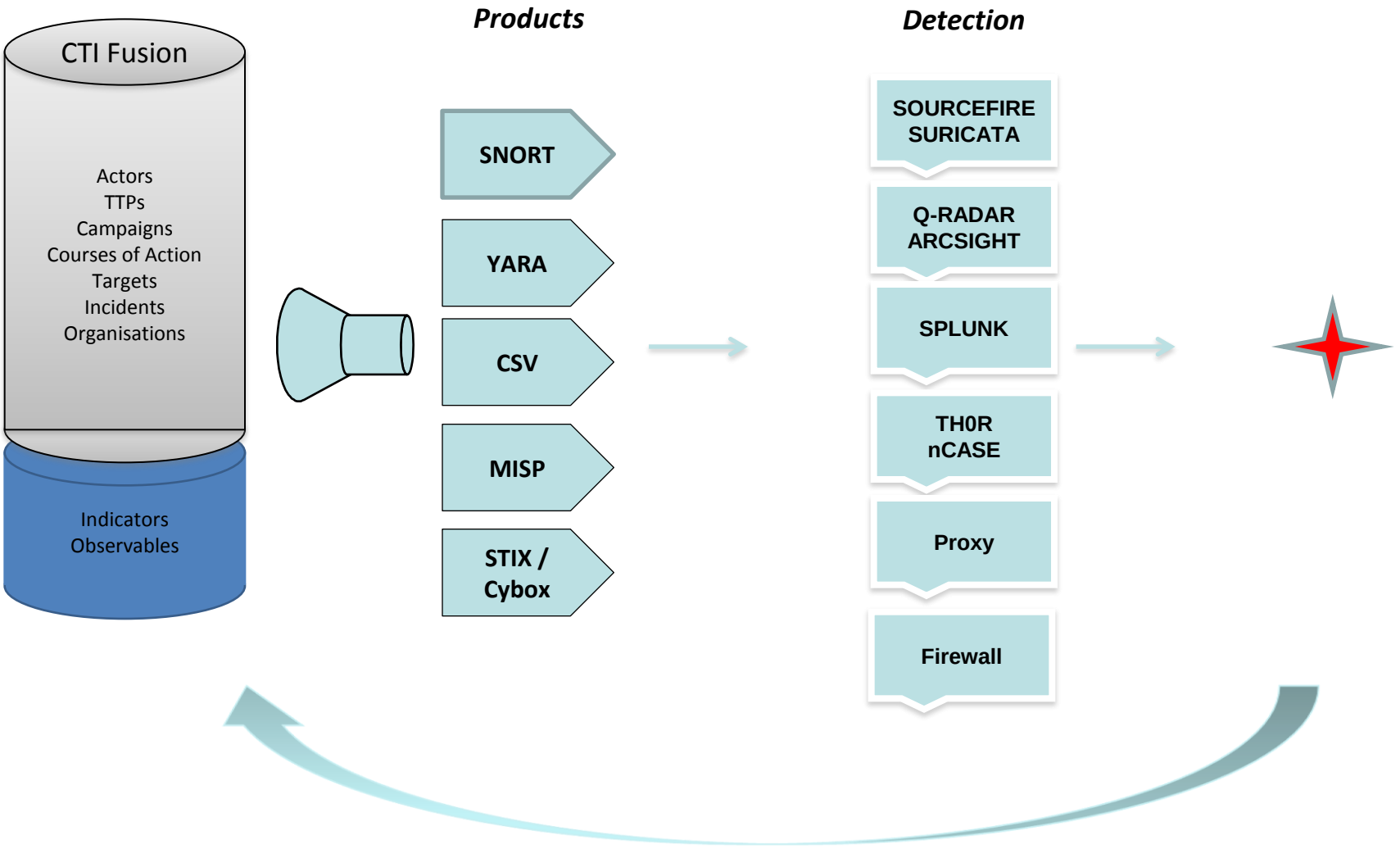
Adapting the Product to the Audience

Strategic	• Understanding the broader context. • Strategic context: profile, motives, new techniques/tactics, sector and location of victims, business risk. • Planning high level actions for non-technical treatment of the threat.	• CEO • Business VP • CIO	Periodic Bulletin	**Threat Landscape** **Security Brief**
Tactical	• Understanding cyber-attacks tactical context: threat type and level, timing of events, techniques/malware. • Planning structured course of actions for permanent protection	• CIO • Cyber-defense teams	For every significant campaign	**Threat Alert Report (CITAR)**
Technical	• Immediate reaction to threats: Detection, Prevention, Reaction (eradication, recovery), Report • Dynamic feeding cyber-defense tools: IDS, IPS, SIEM, Security Scanners, Mailguard, Firewalls, etc	• Cyber-defense teams • IT administrators (or direct tool feeding)	(Near real-time -> Towards full automation)	**Indicators Signatures Rules Detection Mechanisms (CIMBL)**

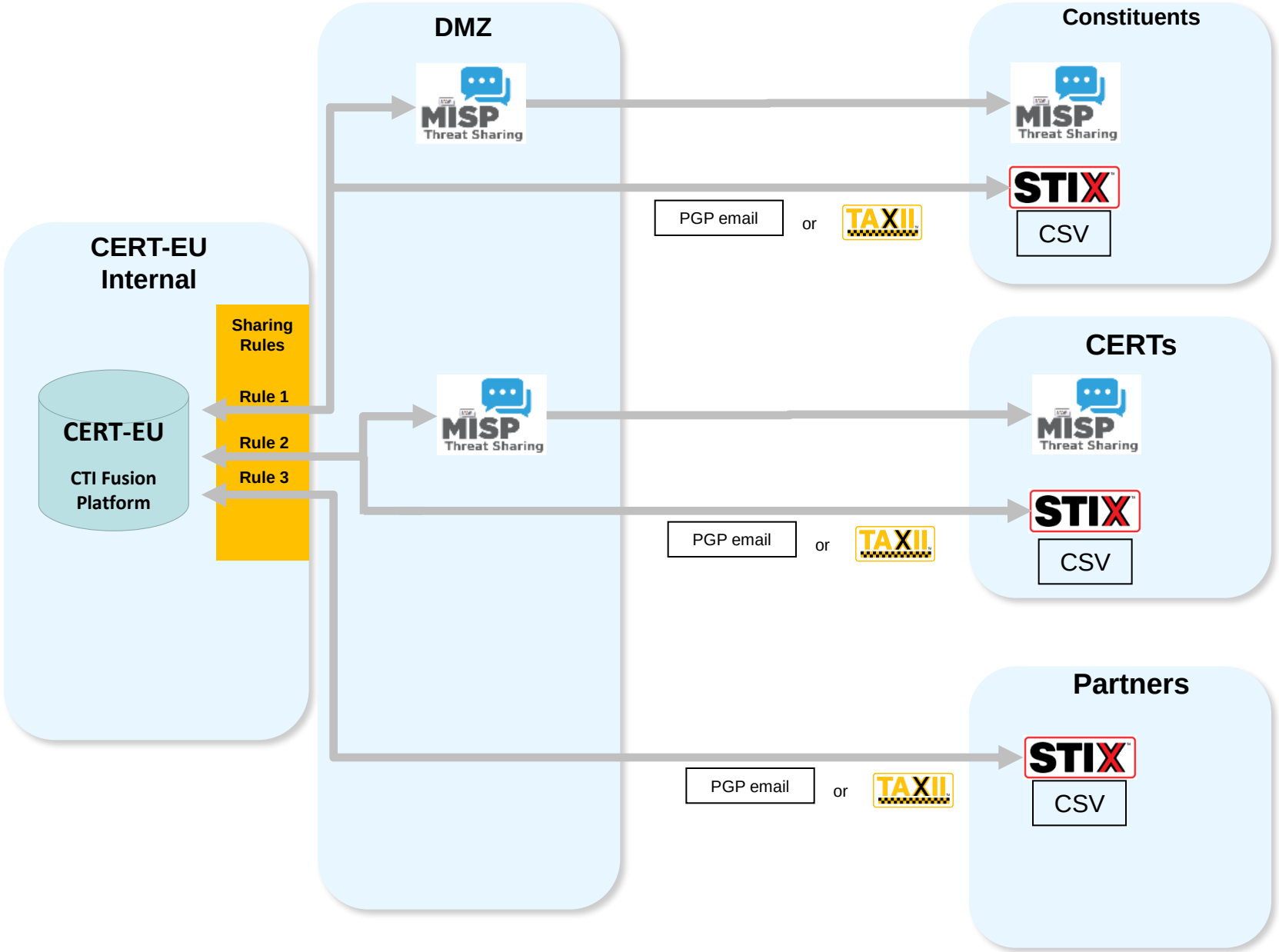
Routing / Course of Action



Feedback +/-


CTI Fusion
Actors
TTPs
Campaigns
Courses of Action
Targets
Incidents
Organisations
Indicators
Observables
Products
SNORT
YARA
CSV
MISP
STIX / Cybox
Detection
SOURCEFIRE SURICATA
Q-RADAR ARCSIGHT
SPLUNK
TH0R nCASE
Proxy
Firewall

Sharing Groups



Sharing Rules

Sharing Groups

1. ***Constituents***
2. ***CERTs***
3. ***Partners*** (NDA)

Sharing Criteria

- *TLP*
- *Proximity*
- *Producer*

Sharing Security

- *Sharing = workflow-based*
- *Export control to avoid errors*
- *TLP enforcement*
- *Encryption*
- *Anonymisation*
- *Source security*
- *Data Protection enforcement*

Sharing Rules

Rule1 : (TLP <> RED) AND (TargetedDomain <> Outside World)

Rule 2 : (Producer = 'Constituent ' OR 'CERT-EU') AND (TLP <> 'RED')

Rule 3 : (Producer = 'Constituent ' OR 'CERT-EU') AND (TLP <> 'RED' OR 'AMBER")

Disruptive Change in Risk

- Change in proximity of a high threat actor
- Detection in the constituency of a high threat actor

- Alert + Context
- Active hunting

- « Don’t wait until Monday »

Some Open Issues

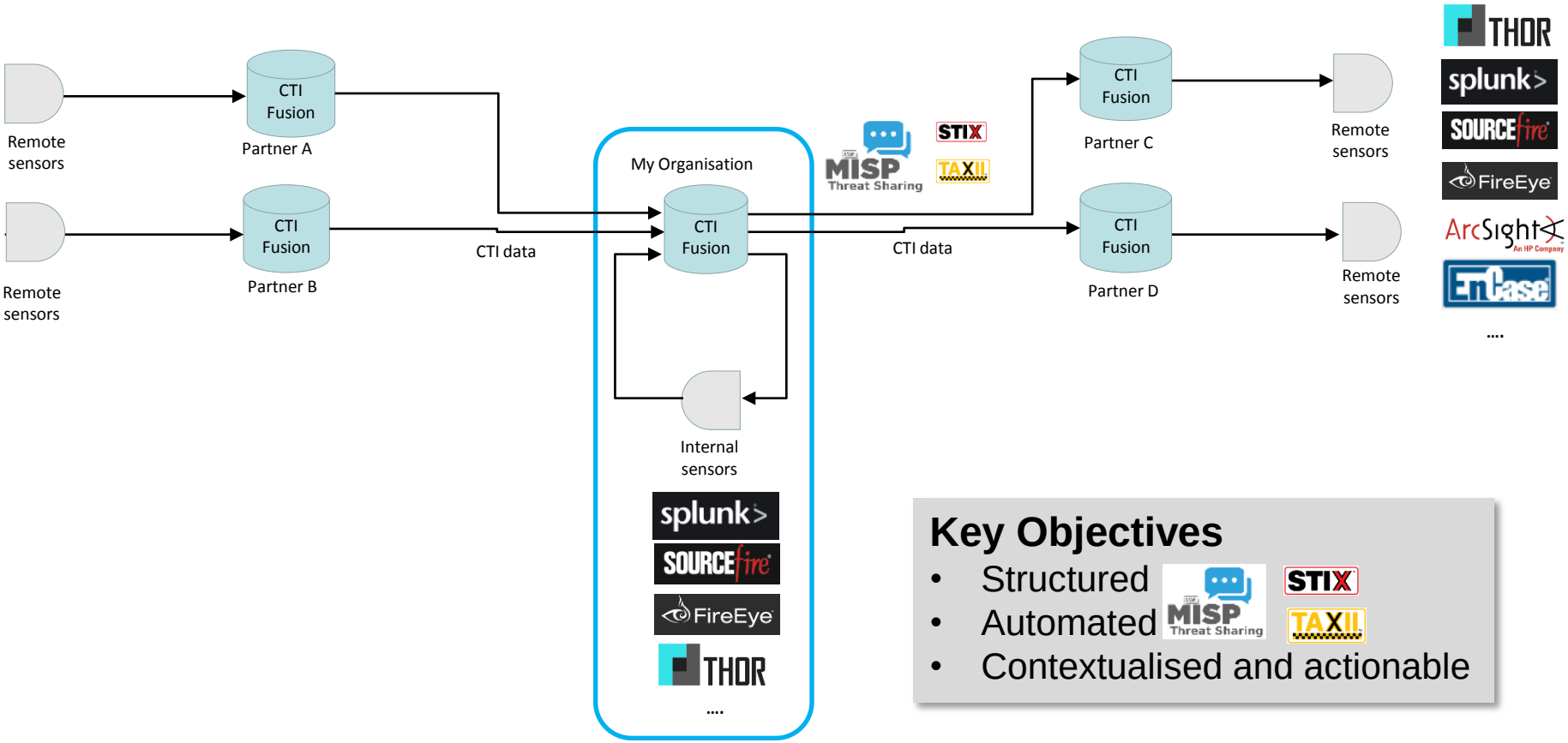
- How to manage lifetime of the data
- How to remove data downstream
  - Ageing window – Time-To-Live (TTL)
  - Feedback positives/false positives
  - Full set ('master_ioc')
- How to control sharing groups downstream
- Implement Routing / Course of Action
- How to maintain the treasure trove of TTPs
  - Dependent on human contacts

Outlook

- Network of interacting CTI fusion centers
- World-wide sensor network
- Signature-less detection

computer emergency response team | CERT-EU for the EU institutions, bodies and agencies

Outlook - Automated End-to-end Workflow



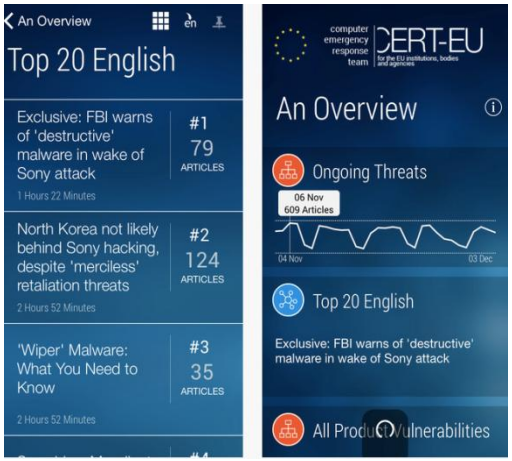
Key Objectives

- Structured
- Automated
- Contextualised and actionable

STIX MISP Threat Sharing TAXII

Thank You

http://cert.europa.eu/



More On Cyber Threat Contextualisation

https://www.sstic.org/media/SSTIC2015/SSTIC-actes/contextualised_and_actionable_information_sharing_/SSTIC2015-Article-contextualised_and_actionable_information_sharing_within_the_cyber-security_community-garnier.pdf