

TURNING DATA INTO ACTIONABLE INTELLIGENCE

ADVANCED FEATURES IN MISP SUPPORTING YOUR ANALYSTS AND TOOLS

CIRCL / TEAM MISP PROJECT



13TH ENISA-EC3 WORKSHOP



2024-10-02

Turning data into actionable intelligence

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THE AIM OF THIS PRESENTATION

- Why is **contextualisation** important?
- What options do we have in MISP?
- How can we **leverage** this in the end?

└ The aim of this presentation

- Why is **contextualisation** important?
- What options do we have in MISP?
- How can we **leverage** this in the end?

- Contextualisation became more and more important as we as a community matured
 - ▶ **Growth and diversification** of our communities
 - ▶ Distinguish between information of interest and raw data
 - ▶ **False-positive** management
 - ▶ TTPs and aggregate information may be prevalent compared to raw data (risk assessment)
 - ▶ **Increased data volumes** leads to a need to be able to prioritise
- These help with filtering your TI based on your **requirements...**
- ...as highlighted by Pasquale Stirparo *Your Requirements Are Not My Requirements*

└─ The growing need to contextualise data

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- Some main objectives we want to achieve when producing data
 - ▶ Ensure that the information is **consumable** by everybody
 - ▶ That it is **useful** to the entire target audience
 - ▶ The data is **contextualised** for it to be understood by everyone
- What we ideally want from our data
 - ▶ We want to be able to **filter** data for different use-cases
 - ▶ We want to be able to get as much knowledge out of the data as possible
 - ▶ We want to know where the data is from, how it got there, why we should care

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- Context added by analysts / tools
- Data that tells a story
- Encoding analyst knowledge to automatically leverage the above

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└ Different layers of context

- Context added by analysts / tools
- Data that tells a story
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CONTEXT ADDED BY ANALYSTS / TOOLS

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└ Context added by analysts / tools

CONTEXT ADDED BY ANALYSTS / TOOLS

- An IP address by itself is barely ever interesting
- We need to tell the recipient / machine why this is relevant
- All data in MISP has a bare minimum required context
- We differentiate between indicators and supporting data

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└ Context added by analysts / tools

└ Expressing why data-points matter

- An IP address by itself is barely ever interesting
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BROADENING THE SCOPE OF WHAT SORT OF CONTEXT WE ARE INTERESTED IN

- **Who** can receive our data? **What** can they do with it?
- **Data accuracy, source reliability**
- **Why** is this data relevant to us?
- **Who** do we think is behind it, **what tools** were used?
- What sort of **motivations** are we dealing with? Who are the **targets**?
- How can we **block/detect/remediate** the attack?
- What sort of **impact** are we dealing with?

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└ Context added by analysts / tools

└ Broadening the scope of what sort of context we are interested in

BROADENING THE SCOPE OF WHAT SORT OF CONTEXT WE ARE INTERESTED IN

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TAGGING AND TAXONOMIES

- Simple labels
- Standardising on vocabularies
- Different organisational/community cultures require different nomenclatures
- Triple tag system - taxonomies
- JSON libraries that can easily be defined without our intervention

<input type="checkbox"/> Tag	Events	Attributes	Tags
<input type="checkbox"/> workflow:state="complete"	11	0	workflow:state="complete" 🔗
<input type="checkbox"/> workflow:state="draft"	0	0	workflow:state="draft" 🔗
<input type="checkbox"/> workflow:state="incomplete"	55	10	workflow:state="incomplete" 🔗
<input type="checkbox"/> workflow:state="ongoing"	0	0	workflow:state="ongoing" 🔗

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- Taxonomy tags often **non self-explanatory**
 - ▶ Example: universal understanding of tlp:green vs APT 28
- For the latter, a single string was ill-suited
- So we needed something new in addition to taxonomies - **Galaxies**
 - ▶ Community driven **knowledge-base libraries used as tags**
 - ▶ Including descriptions, links, synonyms, meta information, etc.
 - ▶ Goal was to keep it **simple and make it reusable**
 - ▶ Internally it works the exact same way as taxonomies (stick to **JSON**)

🔗 Ransomware galaxy	
Galaxy ID	373
Name	Ransomware
Namespace	misp
Uuid	3f44af2e-1480-4b6b-9aa8-f9bb21341078
Description	Ransomware galaxy based on...
Version	4
Value ↓	Synonyms
.CryptoHasYou.	
777	Sevleg
7ev3n	7ev3n-HONEST

└ Context added by analysts / tools

└ Galaxies

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THE EMERGENCE OF ATT&CK AND SIMILAR GALAXIES

- Standardising on high-level **TTPs** was a solution to a long list of issues
- Adoption was rapid, tools producing ATT&CK data, familiar interface for users
- A much better take on kill-chain phases in general
- Feeds into our **filtering** and **situational awareness** needs extremely well
- Gave rise to other, ATT&CK-like systems tackling other concerns
 - ▶ **attck4fraud** ¹ by Francesco Bigarella from ING
 - ▶ **Election guidelines** ² by NIS Cooperation Group

¹https://www.misp-project.org/galaxy.html#_attck4fraud

²https://www.misp-project.org/galaxy.html#_election_guidelines

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└ Context added by analysts / tools

└ The emergence of ATT&CK and similar galaxies

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DATA THAT TELLS A STORY

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└─ Data that tells a story

DATA THAT TELLS A STORY

- Atomic attributes were a great starting point, but lacking in many aspects
- **MISP objects**³ system
 - ▶ Simple **templating** approach
 - ▶ Use templating to build more complex structures
 - ▶ Decouple it from the core, allow users to **define their own** structures
 - ▶ MISP should understand the data without knowing the templates
 - ▶ Massive caveat: **Building blocks have to be MISP attribute types**
 - ▶ Allow **relationships** to be built between objects

³<https://github.com/MISP/misp-objects>

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└ Data that tells a story

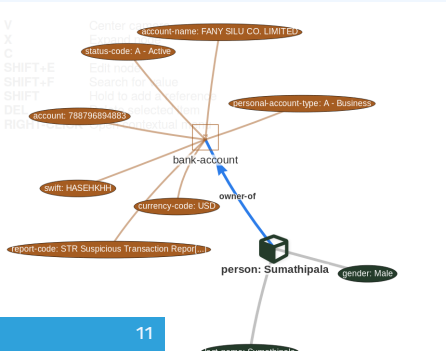
└ More complex data-structures for a modern age

- Atomic attributes were a great starting point, but lacking in many aspects
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SUPPORTING SPECIFIC DATAMODELS

Date	Org	Category	Type	Value	Tags	Galaxies	Comment	Correlate	Related Events
2018-09-28				Name: bank-account			References: 0		
2018-09-28	Other	status-code:	text	A - Active		Add			
2018-09-28	Other	report-code:	text	STR Suspicious Transaction Report		Add			
2018-09-28	Other	personal-account-type:	text	A - Business		Add			
2018-09-28	Financial fraud	swift:	text	HASEH09H		Add		<input checked="" type="checkbox"/>	3840 11320 11584
2018-09-28	Financial fraud	account:	text	788796894883		Add		<input checked="" type="checkbox"/>	
2018-09-28	Other	account-name:	text	FANY SILU CO. LIMITED		Add		<input checked="" type="checkbox"/>	
2018-09-28	Other	currency-code:	text	USD		Add		<input type="checkbox"/>	



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- └ Data that tells a story
- └ Supporting specific datamodels



CONTINUOUS FEEDBACK LOOP

- Data shared was **frozen in time**
- All we had was a creation/modification timestamp
- Improved tooling and willingness allowed us to create a **feedback loop**
- Lead to the introduction of the **Sighting system**
- Signal the fact of an indicator sighting...
- ...as well as **when** and **where** it was sighted
- Vital component for IoC **lifecycle management**

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└ Data that tells a story

└ Continuous feedback loop

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CONTINUOUS FEEDBACK LOOP (2)

Events				
<input checked="" type="checkbox"/>	No	Sightings CIRCL: 2 (2017-03-19 16:17:59)		
<input checked="" type="checkbox"/>	No	Inherit	(2/0/0)	
<input checked="" type="checkbox"/>	No	Inherit	(0/0/0)	

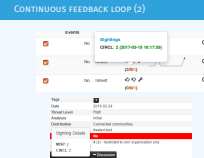
Tags	+
Date	2016-02-24
Threat Level	High
Analysis	Initial
Distribution	Connected communities
Sighting Details	freetext test
MISP: 2	No
CIRCL: 2	4 (2) - restricted to own organisation only.
Discussion	

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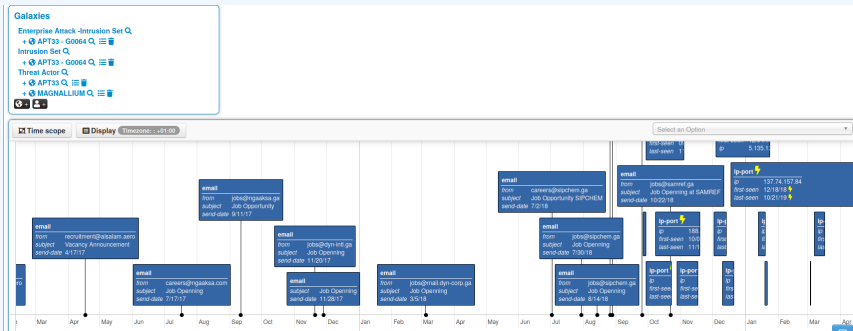
└ Data that tells a story

└ Continuous feedback loop (2)



A BRIEF HISTORY OF TIME - ADDING TEMPORALITY TO OUR DATA

- As Andreas said - no time based aspect was painful
- Recently introduced **first_seen** and **last_seen** data points
- Along with a complete integration with the **UI**
- Enables the **visualisation** and **adjustment** of indicators timeframes

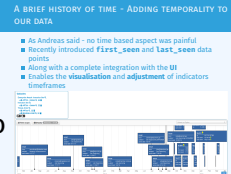


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└ Data that tells a story

- └ A brief history of time - Adding temporality to our data



THE VARIOUS WAYS OF ENCODING ANALYST KNOWLEDGE TO AUTOMATI- CALLY LEVERAGE OUR TI

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- └ The various ways of encoding analyst knowledge to automatically leverage our TI

THE VARIOUS WAYS OF ENCODING
ANALYST KNOWLEDGE TO AUTOMATI-
CALLY LEVERAGE OUR TI

FALSE POSITIVE HANDLING

- Low quality / false positive prone information being shared
- Lead to **alert-fatigue**
- Exclude organisation xy out of the community?
- FPs are often obvious - **can be encoded**
- **Warninglist system**⁴ aims to do that
- Lists of well-known indicators which are often false-positives like RFC1918 networks, ...

LIST OF KNOWN IPV4 PUBLIC DNS RESOLVERS

Id	89
Name	List of known IPv4 public DNS resolvers
Description	Event contains one or more public IPv4 DNS resolvers as attribute with an IDS flag set
Version	20181114
Type	string
Accepted attribute types	ip-src, ip-dst, domain/ip
Enabled	Yes (disable)
Values	
1.0.0.1	
1.1.1.1	
1.1.1.1.4	

Warning: Potential false positives

List of known IPv4 public DNS resolvers
Top 1000 website from Alexa
List of known google domains

⁴<https://github.com/MISP/misp-warninglists>

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- └ The various ways of encoding analyst knowledge to automatically leverage our TI
 - └ False positive handling

FALSE POSITIVE HANDLING

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■ Providing advanced ways of querying data

- ▶ Unified export APIs
- ▶ Incorporating all contextualisation options into **API filters**
- ▶ Allowing for an **on-demand** way of **excluding potential false positives**
- ▶ Allowing users to easily **build their own** export modules feed their various tools

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- └ The various ways of encoding analyst knowledge to automatically leverage our TI
 - └ Making use of all this context

- Providing advanced ways of querying data
 - ▶ Unified export APIs
 - ▶ Incorporating all contextualisation options into **API filters**
 - ▶ Allowing for an **on-demand** way of **excluding potential false positives**
 - ▶ Allowing users to easily **build their own** export modules feed their various tools

EXAMPLE QUERY

/attributes/restSearch

```
{
  "returnFormat": "netfilter",
  "enforceWarninglist": 1,
  "tags": {
    "NOT": [
      "tlp:white",
      "type:OSINT"
    ],
    "OR": [
      "misp-galaxy:threat-actor=\"Sofacy\"",
      "misp-galaxy:sector=\"Chemical\""
    ],
  }
}
```

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└ The various ways of encoding analyst knowledge
to automatically leverage our TI

└ Example query

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    ],
  }
}
```

EXAMPLE QUERY TO GENERATE ATT&CK HEATMAPS

/events/restSearch

```
{
  "returnFormat": "attack",
  "tags": [
    "misp-galaxy:sector=\"Chemical\""
  ],
  "timestamp": "365d"
}
```

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└ The various ways of encoding analyst knowledge to automatically leverage our TI

└ Example query to generate ATT&CK heatmaps

```
/events/restSearch
{
  "returnFormat": "attack",
  "tags": [
    "misp-galaxy:sector=\"Chemical\""
  ],
  "timestamp": "365d"
}
```

A SAMPLE RESULT FOR THE ABOVE QUERY

Enterprise Attack - Attack Pattern											
Mobile Attack - Attack Pattern											
0 11 🔥🔍Show all											
Initial access	Execution	Persistence	Privilege escalation	Defense evasion	Credential access	Discovery	Lateral movement	Collection	Exfiltration	Command and control	
Spearphishing Attachment	Scripting	Screensaver	File System Permissions Weakness	Process Hollowing	Securityd Memory	Password Policy Discovery	AppleScript	Data from Information Repositories	Exfiltration Over Alternative Protocol	Standard Application Layer Protocol	
Spearphishing via Service	Command-Line Interface	Login Item	AppCert DLLs	Code Signing	Input Capture	System Network Configuration Discovery	Distributed Component Object Model	Data from Removable Media	Exfiltration Over Command and Control Channel	Communication Through Removable Media	
Trusted Relationship	User Execution	Trap	Application Shimming	Rookit	Bash History	Process Discovery	Pass the Hash	Man in the Browser	Data Compressed	Custom Command and Control Protocol	
Replication Through Removable Media	Regsvcs/Regasm	System Firmware	Scheduled Task	NTFS File Attributes	Exploitation for Credential Access	Network Share Discovery	Exploitation of Remote Services	Data Staged	Automated Exfiltration	Multi-Stage Channels	
Exploit Public-Facing Application	Trusted Developer Utilities	Registry Run Keys / Start Folder	Startup Items	Exploitation for Defense Evasion	Private Keys	Peripheral Device Discovery	Remote Desktop Protocol	Screen Capture	Scheduled Transfer	Remote Access Tools	
Spearphishing Link	Windows Management Instrumentation	LC_LOAD_DYLIB Addition	New Service	Network Share Connection Removal	Brute Force	Account Discovery	Pass the Ticket	Email Collection	Data Encrypted	Uncommonly Used Port	
Valid Accounts	Service Execution	LSASS Driver	Sudo Caching	Process Doppelganging	Password Filter DLL	System Information Discovery	Windows Remote Management	Clipboard Data	Exfiltration Over Other Network Medium	Multilayer Encryption	
Supply Chain Compromise	CMSTP	Rc.common	Process Injection	Disabling Security Tools	Two-Factor Authentication Interception	System Network Connections Discovery	Windows Admin Shares	Video Capture	Exfiltration Over Physical Medium	Domain Fronting	
Drive-by Compromise	Control Panel Items	Authentication Package	Bypass User Account Control	Timestamp	LLMNR/NBT-NS Poisoning	Network Service Scanning	Remote Services	Audio Capture	Data Transfer Size Limits	Data Obfuscation	
Hardware Additions	Dynamic Data Exchange	Component Firmware	Extra Window Memory Injection	Modify Registry	Credentials in Files	File and Directory Discovery	Taint Shared Content	Data from Network Shared Drive	Connection Proxy		
	Source	Windows Management Instrumentation Event Subscription	Setuid and Setgid	Indicator Removal from Tools	Forced Authentication	Security Software Discovery	Application Deployment Software	Data from Local System	Commonly Used Port		
	Space after Filename	Change Default File	Launch Daemon	Hidden Window	Keychain	System Service Discovery	Third-party Software	Automated Collection	Data Encoding		

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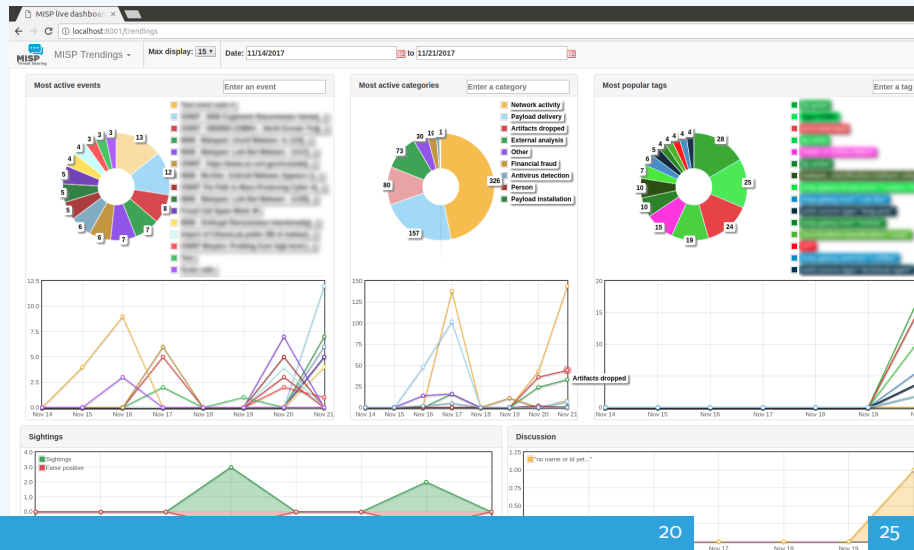
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- The various ways of encoding analyst knowledge to automatically leverage our TI
- A sample result for the above query



A SAMPLE RESULT FOR THE ABOVE QUERY

MONITOR TRENDS OUTSIDE OF MISP (EXAMPLE: DASHBOARD)

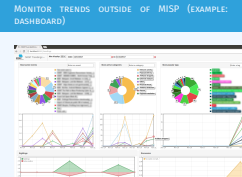


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└ The various ways of encoding analyst knowledge to automatically leverage our TI

└ Monitor trends outside of MISP (example: dashboard)



- We were still missing a way to use all of these systems in combination to decay indicators
- Move the decision making **from complex filter options to complex decay models**
- Decay models would take into account various available **context**
 - ▶ Taxonomies
 - ▶ Sightings
 - ▶ type of each indicator
 - ▶ Creation date
 - ▶ ...

- └ The various ways of encoding analyst knowledge to automatically leverage our TI
 - └ Decaying of indicators

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 - ▶ type of each indicator
 - ▶ Creation date
 - ▶ ...

IMPLEMENTATION IN MISP: Event/view

The screenshot shows the MISP Event/view interface. At the top, there are tabs for 'Plots', 'Galaxy', 'Event graph', 'Correlation graph', 'ATTACK matrix', 'Attributes', and 'Discussion'. Below these is a search bar and a 'Galaxies' section. The main table displays a list of events with columns for Date, Org, Category, Type, Value, Tags, Galaxies, Comment, Correlate, Related Events, Feed hits, IDS Distribution, Sightings, Activity, Score, and Actions. The 'Decay score' toggle button is visible in the top right corner of the table.

Date	Org	Category	Type	Value	Tags	Galaxies	Comment	Correlate	Related Events	Feed hits	IDS Distribution	Sightings	Activity	Score	Actions
2019-09-12		Network activity	ip-src	5.5.5.5										NIDS Simple Decaying ... 65.26 Model 5 79.88	
2019-08-13		Network activity	ip-src	8.8.8.8	admiralty-scale:source-reliability="A" x retention:expired x				1 2 2 2 S1:1 S1:2 Show 11 more...					NIDS Simple Decaying ... 54.6 Model 5 52.69	
2019-08-13		Network activity	ip-src	9.9.9.9	admiralty-scale:source-reliability="C" x misp:confidence-level="completely-confident" x tlp:number x				1 3 19 S1:1 28 Show 6 more...					NIDS Simple Decaying ... 37.43 Model 5 0	
2019-08-13		Network activity	ip-src	7.7.7.7	admiralty-scale:information-credibility="4" x retention:2d x				41					NIDS Simple Decaying ... 37.41 Model 5 0	
2019-07-18		Network activity	ip-src	6.6.6.6					41					NIDS Simple Decaying ... 23.31 Model 5 0	

- Decay score toggle button
 - Shows Score for each Models associated to the Attribute type

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- └ The various ways of encoding analyst knowledge to automatically leverage our TI
 - └ Implementation in MISP: Event/view



IMPLEMENTATION IN MISP: API RESULT

/attributes/restSearch

```
"Attribute": [
  {
    "category": "Network activity",
    "type": "ip-src",
    "to_ids": true,
    "timestamp": "1565703507",
    [...]
    "value": "8.8.8.8",
    "decay_score": [
      {
        "score": 54.475223849544456,
        "decayed": false,
        "DecayingModel": {
          "id": "85",
          "name": "NIDS Simple Decaying Model"
        }
      }
    ]
  }
]
```

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└─ The various ways of encoding analyst knowledge to automatically leverage our TI

└─ Implementation in MISP: API result

```
IMPLEMENTATION IN MISP: API RESULT
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        "decayed": false,
        "DecayingModel": {
          "id": "85",
          "name": "NIDS Simple Decaying Model"
        }
      }
    ]
  }
]
```

- Massive rise in **user capabilities**
- Growing need for truly **actionable threat intel**
- Lessons learned:
 - ▶ **Context is king** - Enables better decision making
 - ▶ **Intelligence and situational awareness** are natural by-products of context
 - ▶ Don't lock users into your **workflows**, build tools that enable theirs

Turning data into actionable intelligence

- └ The various ways of encoding analyst knowledge to automatically leverage our TI
 - └ To sum it all up...

- Massive rise in **user capabilities**
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 - ▶ **Context is king** - Enables better decision making
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■ Contact us

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- ▶ <https://www.circl.lu/>

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- ▶ <https://github.com/MISP>
- ▶ <https://gitter.im/MISP/MISP>
- ▶ <https://twitter.com/MISPPProject>

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Turning data into actionable intelligence

└─ The various ways of encoding analyst knowledge to automatically leverage our TI

└─ Get in touch if you have any questions

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