AN INTRODUCTION TO WORKFLOWS IN MISP

MISP - THREAT SHARING

CIRCL / TEAM MISP PROJECT

MISP Project https://www.misp-project.org/

13TH ENISA-EC3 WORKSHOP



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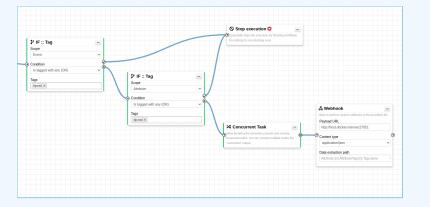
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AN INTRODUCTION TO WORKFLOWS IN MISP MISP - THREAT SHARING



CONTENT OF THE PRESENTATION

- MISP Workflows fundamentals
- Getting started
- Design of the system & how it can be extended



An Introduction to Workflows in MISP

Content of the presentation



MISP Workflows fundamentals
 Getting started
 Design of the system & how it can be extended



3

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WHAT PROBLEMS ARE WE TRYING TO TACKLE

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└─What problems are we trying to tackle



Send notifications in a chat rooms
 And much much more.

Workshop organized by the Canadian Cyber Cente



Initial idea came during GeekWeek7.5¹

Needs:

- Prevent default MISP behaviors
- Hook specific actions to run callbacks

Use-cases:

- Prevent publication of events not meeting some criterias
- Prevent querying thrid-party services (e.g. virustotal) with sensitive information
- Send notifications in a chat rooms
- And much much more..

¹Workshop organized by the Canadian Cyber Center

9

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WORKFLOW - FUNDAMENTALS

WORKFLOW - FUNDAMENTALS

SIMPLISTIC OVERVIEW OF A WORKFLOW IN ACTION

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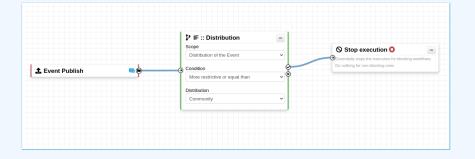
Simplistic overview of a Workflow in action

- 1. An action happens in MISP
- 2. If there is an enabled Workflow for that action, run it
- 3. If all went fine, MISP continue to perform the action
 - r operation can potentiatly be cancelled by block dules

- 1. An **action** happens in MISP
- 2. If there is an **enabled** Workflow for that **action**, run it
- 3. If all went fine, MISP continue to perform the action
 - The operation can potentially be cancelled by blocking modules

TERMINOLOGY

- workflow: Sequence of all operations (nodes) to be executed. Basically the whole graph.
- **execution path**: A path composed of nodes
- **trigger**: Starting point of a workflow. Triggers are called when specific actions happen in MISP
 - ► A trigger can only have one workflow and vice-versa



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└─ Terminology

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 workflow: Sequence of all operations (nodes) to be executed. Basically the whole graph. execution path. A path composed of nodes trigger: Starting point of a workflow. Triggers are called when specific actions happen in MISP A trigger can only have one workflow and vice-versa



WORKFLOW EXECUTION PROCESS

Typical execution process:

- 1. An action happens in MISP
- 2. The workflow associated to the trigger is ran
- 3. Execution result?
 - success: Continue the action
 - failure | blocked: Cancel the action

Example for Event publish:

- 1. An Event is about to be published
- 2. MISP executes the workflow listening to the event-publish trigger
 - **success**: Continue the publishing action
 - failure | blocked: Stop publishing and log the reason

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└─Workflow execution process

WORKFLOW EXECUTION PROCESS

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BLOCKING AND NON-BLOCKING WORKFLOWS

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Blocking and non-blocking Workflows

Currently 2 types of workflow

- Blocking: Completion of the action can be prevented
 If a blocking module blocks the action
- If a blocking module raises an exception
- Non-blocking: Workflow execution outcome has no impact Blocking mediates can still stop the execution

Currently 2 types of workflows:

- **Blocking**: Completion of the action can be prevented
 - ► If a **blocking module** blocks the action
 - ► If a **blocking module** raises an exception
- Non-blocking: Workflow execution outcome has no impact
 - **Blocking modules** can still stop the execution

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EXECUTION CONTEXT

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Execution context

Workflows can be triggered by any users

■ Workflows can be triggered by actions done via the UI or API

- However, the user for which the workflow executes has:
 - The site-admin permission
 - Is from the MISP.host_org_id
- Ensures data is processed regardless of ownership and access: no ACL

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CLASSES OF WORKFLOW MODULES

Actions

3 classes of modules

- **action**: Allow to executes functions, callbacks or scripts
 - Can stop execution
 - e.g. Webhook, block the execution, perform enrichments, ...
- **logic**: Allow to redirect the execution flow.
 - IF condition, fork the blocking execution into a non-blocking one, ...
- **blueprint**: Allow to reuse composition of modules
 - Can save subworkflows and its module's configuration

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Classes of Workflow modules

	Actions		A Discorts	
3 classes o				
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action	Allow to exer n stop execution	in .		
■ action ► Ca ► e.	Allow to exer n stop execution	in lick the exec	ution, perform enr	

Can save subworkflows and its module's configuration

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SOURCES OF WORKFLOW MODULES

3 sources of action modules

Built-in **default** modules

- Part of the MISP codebase
- app/Model/WorkflowModules/action/[module_name].php

User-defined custom modules

- ► Written in PHP
- Can extend existing default modules
- Can use MISP's built-in functionalities (restsearch, enrichment, push to zmq, ...)
- **Faster and easier to implement new complex behaviors**
- app/Lib/WorkflowModules/action/[module_name].php

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└─Sources of Workflow modules

sources of action modules Built-in default modules

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- Part of the MISP codebase
 app/Hodel/WorkflowModules/action/[module_na
- User-defined custom modules
 - Written in PHP
 - Can extend existing default modules
 Can use MISP's built-in functionalities (rest
 - enrichment, push to zmq, ...)

Sources of Workflow modules

3 sources of action modules

- Modules from the enrichment service
 - Default and custom modules
 - ► From the *misp-module*
 - ► Written in Python
 - Can use any python libraries
 - New misp-module module type: action
 - \rightarrow Both the PHP and Python systems are plug-and-play

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└─Sources of Workflow modules



Both the PHP and Python systems are plug-and-play

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TRIGGERS CURRENTLY AVAILABLE

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└─Triggers currently available

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A the Marine	-	•	The tage is added to a set for the section in the section of the s						
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Currently 8 triggers can be hooked. 3 being **blocking**.

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Be database Image: Control of the database Image: Control of the publishing process Image: Control of the publishing	* Enrichment Before Query	others	low		841	~	*	162	2022-07-29 08:32:32	*	∎⋪∎๏
We object After Save object This trigger is called after an Object has been saved in 36 × ✓ 161 2022-07-28 1359-37 × ✓ 0 P Post After Save post Imager is called after an Object has been saved in 36 × × 176 2022-07-28 1359-51 ✓ ● ● L User After Save user Imager is called after an user has been saved in 35 × × 159 2022-07-28 1359-51 ● <t< td=""><td>Event After Save</td><td>event</td><td>medium 😧</td><td></td><td>11</td><td>×</td><td>*</td><td>175</td><td>2022-07-29 08:37:23</td><td>*</td><td>∎∲⊟∅</td></t<>	Event After Save	event	medium 😧		11	×	*	175	2022-07-29 08:37:23	*	∎∲⊟∅
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the database & User Before Save user I Ibm This trigger is called just before a user is save in the 42 × × 158 2022-07-28 14:00.32 × ■ $\phi \blacksquare \phi$	Post After Save	post	low		36	×	×	176	2022-07-28 13:59:51	*	∎⋪∎∅
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WORKFLOW - GETTING STARTED

WORKFLOW - GETTING STARTED

GETTING STARTED WITH WORKFLOWS (1)

Review MISP settings:

Make sure MISP.background_jobs is turned on
 Make sure workers are up-and-running and healthy
 Turn the setting Plugin.Workflow_enable on

Overview MI	SP settings (20 🛕)	Encryption set	tings (7 🛕) 🛛 Prox	y settings (5)	Security settings (8 \land)	Plugin settings (465 🕰)	SimpleBackgroundJobs settings (1	1 🗛) Di
Enrichment							Filter the table(s) below	
Import								
Export								
Action								
Critical	Plugin.Action_servic	es_enable	true	Enabl	e/disable the action service	15		
Recommended	Plugin.Action_servic	es_url	http://host.docker.i	nternal The u	rl used to access the action	services. By default, it is a	ccessible at http://127.0.0.1:6666	
Recommended	Plugin.Action_servic	es_port	6677	The p	ort used to access the activ	on services. By detault, it is	accessible at 127.0.0.1:6666	
Recommended	Plugin.Action_timeo	ut	10	Set a	timeout for the action servi	ces		Value not set.

4. [optional:misp-module] Turn the setting Plugin.Action_services_enable on

Overview	MISP settings (20 🛦)	Encryption settings (7 🛦)	Praxy settings (5)	Security settings (8 🛕)	Plugin settings (465 🛕)	SimpleBackgroundJobs settings (11 \Lambda)	Diagno
Enrichmen						Filter the table(s) below	
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Recomme	nded Plugin.Workflow_er	nable	true Enable	aldisable workflow feature			

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 \Box Getting started with workflows (1)

1. Mai 2. Mai	MISP settings: ke sure MISP.background_jobs is turned o ke sure workers are up-and-running and healt n the setting Plugin.Workflow_enable on
	And Alexandra Supervised Advanced Annual Annua
	The Party and the Party of the
	tional:misp-module]Turn the setting ugin.Action_services_enable on
	ten transfe Tenners & Long Tenners Second Statements

GETTING STARTED WITH WORKFLOWS (2)

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Getting started with workflows (2)

GETTING STARTED WITH WORKFLOWS (2)

f you wish to use action modules from misp-module, make unre to have: The latest update of misp-module > There should be an action_mod module type in

misp-modules/misp_modules/modules

his command should show all "action" modules
wrl == http://siz.co.six6666/modules | /
'.[] | select (.meta."module-type"[] | contains("action")) |
me: .mane, version: .meta.version]'

If you wish to use action modules from misp-module, make sure to have:

- The latest update of misp-module
 - There should be an action_mod module type in misp-modules/misp_modules/modules
- Restarted your misp-module application

1 # This command should show all 'action' modules
2 \$ curl -s http://127.0.0.1:6666/modules | \
3 jq '.[] | select(.meta."module-type"[] | contains("action")) |
4 {name: .name, version: .meta.version}'

GETTING STARTED WITH WORKFLOWS (3)

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Getting started with workflows (3)

- 1. Go to the list of modules
- Administration > Workflows > List Modul
- Make sure default modules are loaded
- footional:misp-module] Make sure misp-module module:
- are loaded

1. Go to the list of modules

- Administration > Workflows > List Modules
- or /workflows/moduleIndex
- 2. Make sure **default** modules are loaded
- 3. [optional:misp-module] Make sure **misp-module** modules are loaded

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CREATING A WORKFLOW WITH THE EDITOR

- 1. Go to the list of triggers Administration > Workflows
- 2. Enable and edit a trigger from the list
- 3. Drag an action module from the side panel to the canvas
- From the trigger output, drag an arrow into the action's input (left side)
- 5. Execute the action that would run the trigger and observe the effect!

Trigger name	Scope	Trigger overhead	Description	Run counter	Blocking Workflow	MISP Core format	Workflow ID	Last Update	Enabled	Actions
C Attribute After Save	atribute	high 0	This trigger is called after an Attribute has been saved in the database	58	×	×	160	2022-07-29 06:58:11	*	•••••
* Enrichment Before Query	others	kow	This trigger is called just before a query against the enrichment service is done	841	*	~	162	2022-07-29 08:32:32	*	∎∲≣⊚
Event After Save	event	medium	This trigger is called after an Event has been saved in the database	11	×	×	175	2022-07-29 08:37:23	*	■\$0
1 Event Publish	event	kow	This trigger is called just before a MISP Event starts the publishing process	1	*	~	180	2022-07-29 12:14:10	*	■\$
& Object After Save	object	high 0	This trigger is called after an Object has been saved in the database	35	×	~	161	2022-07-28 13:59:37	×	▶ \$ ₽∎€
Post After Save	post	kow	This trigger is called after a Post has been saved in the database	36	×	×	176	2022-07-28 13:59:51	×	•\$\$
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A* User Before Save	user	low	This trigger is called just before a user is save in the database	42	×	×	150	2022-07-28 14:00:32	*	•\$



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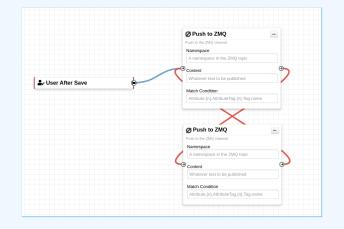
Creating a workflow with the editor

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WORKING WITH THE EDITOR

Operations not allowed:

- Execution loop are not authorized
 - Current caveat: If an action re-run the workflow in any way



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└─Working with the editor

WORKING WITH THE EDITOR

Operations not allowed: Execution loop are not authorized Current caveat: If an action re-run the workflow in any way



16

30

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WORKING WITH THE EDITOR

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└─Working with the editor

WORKING WITH THE EDITOR

Operations not allowed: Multiple connections from the same output Forentine order not suscented and confining for users.



Operations not allowed:

- Multiple connections from the same output
 - **•** Execution order not guaranted and confusing for users



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WORKING WITH THE EDITOR

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└─Working with the editor



Derations showing a warning: Blocking modules after a concurrent tasks module Blocking modules in a non-blocking workflow

1 free banks	 W Concerned Task	 S line security O	
	 And the second s	 Scaling is an including one	

Operations showing a warning:

- Blocking modules after a concurrent tasks module
- **Blocking** modules in a **non-blocking** workflow

		🗙 Concurrent Task 🛛 🔤	Stop execution O
, Event Publish	O Blocking 📖 🖗	Allow breaking the execution process and running concurrent tasks. You can connect multiple nodes the "concurrent" output.	Essentially stops the execution for blocking workflows. Do nothing for non-blocking ones

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WORKFLOW BLUEPRINTS

Blueprints allow to **re-use parts** of a workflow in another one
 Blueprints can be saved, exported and **shared**

Debugging webhook	v1656059209
Default: ×	
Blueprint Content: 1 node	
Webhook module pre-configured for deb purposes	bugging

Blueprints origins:

- From the "official" misp-workflow-blueprints repository
- 2. Created or imported by users

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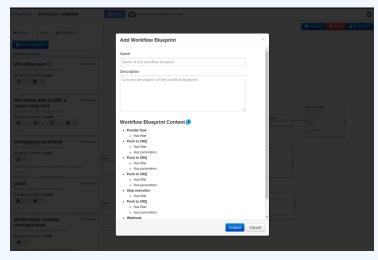
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└─Workflow blueprints

Debugging webhook
Defail: #
Excepter Content & sode
& L
triditook medule pre-configured for debugging purposes

WORKFLOW BLUEPRINTS: CREATE

Select one or more modules to be saved as blueprint then click on the save blueprint button



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└─Workflow blueprints: Create

WORKFLOW BLUEPRINTS: CREATE

Select one or more modules to be saved as blueprint then click on the save blueprint button



20

HASH PATH FILTERING

Some modules have the possibility to filter or check conditions using CakePHP's path expression.

```
1 $path_expression = '{n}[name=fred].id';
2 $users = [
3 {'id': 123, 'name': 'fred', 'surname': 'bloggs'},
4 {'id': 245, 'name': 'fred', 'surname': 'smith'},
5 {'id': 356, 'name': 'joe', 'surname': 'smith'},
6 ];
7 $ids = Hash::extract($users, $path_expression);
8 // => $ids will be [123, 245]
```

Value	
tlp:red	
Operator	
In	```
Hash path	
Attribute.{n}.Tag	

```
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```

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└─ Hash path filtering

	odules have the possibility to filter or check ons using CakePHP's path expression.
2 Susers + [3 ['id': 4 ['id': 5 ['id': 6]; 7 Sids + Hast	<pre>sion = "[n][nume=fred].id"; zz, "nume": "fred", "uurnamesi: "bioggst], st, "nume": "red", "uurnamesi: "smith"], 56, "nume": "jee", "numamesi: "smith"], estract(Suures, Spath_supression); tit be [zzz, zdz]</pre>
	P # :: densets

MODULE FILTERING

Some action modules accept filtering conditions
 E.g. the enrich-event module will only perform the enrichment on Attributes having a tlp:white Tag

Module Filtering		×
Element selector		
Attribute.{n}		
Value		
tlp:white		
Operator		
In		~
Hash Path		
AttributeTag.{n}.Tag.name		
	Save	Close

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└─Module filtering

Notule Filtering	
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Amban han	

DATA FORMAT IN WORKFLOWS

🛓 Event Publish 🛛 🖸 Blocking 🛄 🖕

- All triggers will inject data in a workflow
- In some cases, there is no format (e.g. User after-save)
- In others, the format is **compliant with the MISP Core format**
- In addition to the RFC, the passed data has additional properties
 - Attributes are **always encapsulated** in the Event or Object
 - Additional key _AttributeFlattened
 - Additional key _allTags
 - Additional key inherited for Tags

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L Data format in Workflows





LOGIC MODULE: CONCURRENT TASK

- Special type of logic module allowing multiple connections
 Allows breaking the execution flow into a concurrent tasks to be executed later on by a background worker
- As a side effect, blocking modules cannot cancel ongoing operations



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Logic module: Concurrent Task

LOGIC MODULE: CONCURRENT TAS

 Special type of logic module allowing multiple connections
 Allows breaking the execution flow into a concurrent tasks to be executed later on by a background worker
 As a side effect, blocking modules cannot cancel ongoing onerations



DEBUGGING WORKFLOWS: LOG ENTRIES

Workflow execution is logged in the application logs:

- /admin/logs/index
- Or stored on disk in the following file:
 - /app/tmp/logs/workflow-execution.log
- Use the webhook-listener.py tool
 - /app/tools/misp-workflows/webhook-listener.py

Logs		»					
Email	s Authen	ication issue	es MISP Update res	ults Setti	ng changes	Warnings and e	rrors
id †	Email	Org	Created	Model	Model ID	Action	Title
49146	SYSTEM	SYSTEM	2022-08-01 07:34:40	Workflow	162	execute_workflow	Finished executing workflow for trigger `enrichment-before-query` (162). Outcome: success
49144	SYSTEM	SYSTEM	2022-08-01 07:34:39	Workflow	162	execute_workflow	Started executing workflow for trigger 'enrichment-before-query' (162)

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8

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Lebugging Workflows: Log Entries

	Wor	rkfle	w exect	ution	i is lo	bezed	in the application logs:
		/a	imin/lo	igs/		x	
	Or :	ston	ed on di	sk ir	the	follow	ving file:
		/a1	o/tmo/	100	s/wo	rkfle	w-execution.log
			webho				
							.py tool 'lows/webhook-listener.
	•						
Log	•						
Log	•	/aj					
Log	•	/aj					
Log	•	/aj					
Log		/a		s/8	isp-	workf	

DEBUGGING WORKFLOWS: DEBUG MODE



n Debug Mode: On can be turned on for each workflows

- Each nodes will send data to the provided URL
 - Configure the setting: Plugin.Workflow debug url
- Result can be visualized in
 - offline: tools/misp-workflows/webhook-listener.py
 - **online**: requestbin.com or similar websites

LIVE	PAUSE	Q Type to search
Today		
2:25:10 pm	POST	/end?outcome=blocked
2:25:09 pm	POST	<pre>/exec/stop-execution?result=success</pre>
2:25:09 pm	POST	<pre>/exec/tag-if?result=success</pre>
2:25:08 pm	POST	/init?type=blocking

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-Debugging Workflows: Debug mode

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Debug Model	De:		
			nmows
figure th	ie se	tting: Plugin.Workflow_deb	ig_url
an be vi		lized in	
ine: requ	uest	bin.com or similar websites	istener.py
Teday			
235-23pm	POST	/and heatscame-blacked	
10.000	POST	/em/step-emotion/real-transms	
		/ene/ship-enerties/vesitionness /ene/tap-tifresitionerss	
	teogree des will figure th tan be v ine: too ine: req ney ney ney	teogram te des will sen rigure the ser ine: tools/s ine: roquest ne: roquest ne: roquest	NG WORKFLOWS: DEBUG MODE

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LEARNING BY EXAMPLES

LEARNING BY EXAMPLES

WORKFLOW EXAMPLE 1

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└─Workflow example 1

2024



 The Event-Publish trigger uses the MISP core format
 The LF::Tag module checks if at least one of the Attribute has the tlp:white tag
 If it does, the Push-to-ZMQ module will be executed



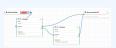
- 1. The Event-Publish trigger uses the MISP core format
- 2. The IF::Tag module checks if at least one of the Attribute has the tlp:white tag
- 3. If it does, the Push-to-ZMQ module will be executed

WORKFLOW EXAMPLE 2

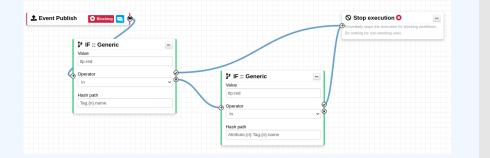
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Workflow example 2

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If an event has the tlp:red tag or any of the attribute has it, the publish process will be cancelled



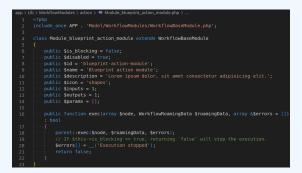
If an event has the tlp:red tag or any of the attribute has it, the publish process will be cancelled

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EXTENDING THE SYSTEM

EXTENDING THE SYSTEM

CREATING A NEW MODULE IN PHP



- app/Lib/WorkflowModules/action/[module_name].php
- Module configuration are defined as public variables
- The exec function has to be implemented.
 - ► If it returns **true**, execution will proceed
 - ► If it returns **false**
 - And the module is blocking, the execution will stop and the operation will be blocked

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8

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└─Creating a new module in PHP

app/Lib/storkflowHodules/action/[module_name].ph
 Module configuration are defined as public variables
 The exec function has to be implemented
 Fift returns true, execution will proceed
 Fift returns false
 A site module is blocking, the execution will step and the

29

CREATING A NEW MODULE IN PYTHON

	sami > git > misp-modules > misp_modules > modules > action_mod > 🚸 testaction.py >
3	
- 4	
5	
6	
7	moduleconfig = {
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	blocking = False
21	
22	
23	
24	
25	returns = 'boolean'
26	
27	moduleinfo = {'version': '0.1', 'author': 'Andras Iklody',
28	colordordorderightion': 'This module is merely a test, always returning true, Triggers on event publishing.'
29	<pre>'module-type': ['action']}</pre>
30	
31	
32	def-handler(g=False):
33	1f g is False:
34	
35	···· result ison.loads(q) ··#-noga
36	••••output = result • # Insert your magic here!
37	····r = {"data": output}
38	
39	
40	
41 >	def introspection():-
64	

 Module configuration are defined in the moduleinfo and moduleconfig variables
 The handler function has to be implemented.

Blocking logic is the same as other modules

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└─Creating a new module in Python



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 The handler function has to be implemented.
 Blocking logic is the same as other modules

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