An Introduction to Workflows in MISP

MISP - Threat Sharing

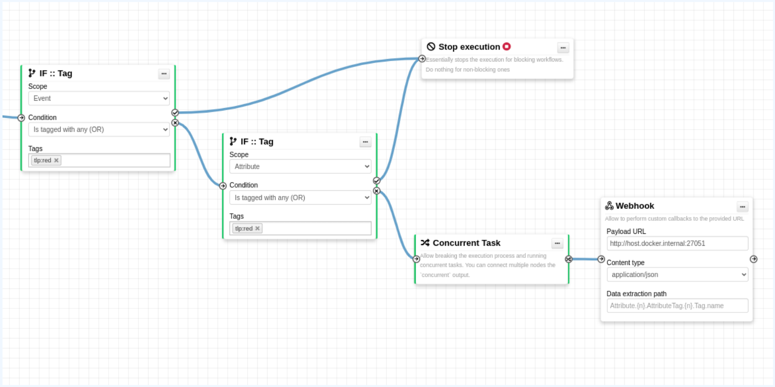
CIRCL / Team MISP Project

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

NSPA

Content of the presentation

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



IF :: Tag
Scope: Event
Condition: Is tagged with any (OR)
Tags: tlp:red

IF :: Tag
Scope: Attribute
Condition: Is tagged with any (OR)
Tags: tlp:red

Stop execution
Essentially stops the execution for blocking workflows. Do nothing for non-blocking ones

Concurrent Task
Allow breaking the execution process and running concurrent tasks. You can connect multiple nodes the `concurrent` output.

Webhook
Allow to perform custom callbacks to the provided URL
Payload URL: http://host.docker.internal:27051
Content type: application/json
Data extraction path: Attribute.{n}.AttributeTag.{n}.Tag.name

What problems are we trying to tackle

- Initial idea came from GeekWeek7.5[1]

- Needs:
  - Prevent default MISP behaviors
  - Hook specific actions via callbacks
- Use-cases:
  - Prevent publication of events not meeting some criterias
  - Prevent querying thrid-party services (e.g. virustotal) with sensitive information
  - Send a notification in a chat room
  - And much much more..

[1]Workshop organized by the Canadian Cyber Center

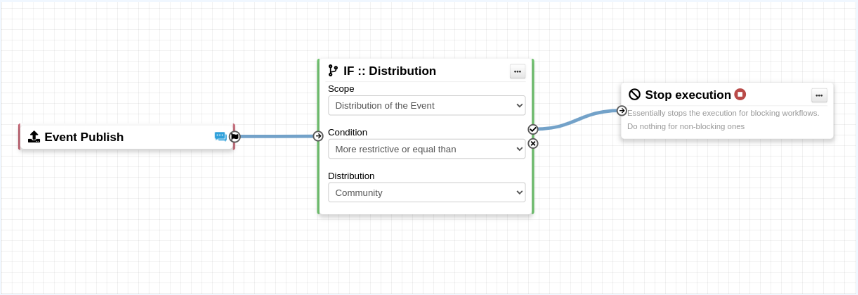
Workflow - Fundamentals

Simplistic overview of a Workflow in action

1. An **action** is performed 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



Scope: Distribution of the Event
Condition: More restrictive or equal than
Distribution: Community

Essentially stops the execution for blocking workflows. Do nothing for non-blocking ones

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`: Proceed 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**: Proceed the publishing action
   - **failure** | `blocked`: Stop publishing and log the reason

Blocking and non-blocking Workflows

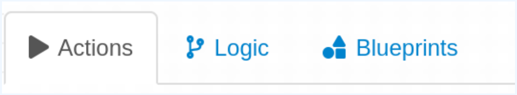
Currently 2 types of workflows:

- **Blocking**: Completion of the initial 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** become **non-blocking**
  - Execution proceed unless on exception

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**

Classes of Workflow modules



3 classes of modules

- **action**: Allow to executes actions, 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 their module's configuration

Sources of Workflow modules

3 sources of action modules

- Built-in **default** modules
  - Written in PHP
  - Can use MISP's built-in functionalities (restsearch, enrichment, push to zmq, ...)
  - Fast and easier to interact with for those having internal knowledge of MISP
  - `app/Model/WorkflowModules/action/[module_name].php`
- User-defined **custom** modules
  - Can extend existing default modules
  - `app/Lib/WorkflowModules/action/[module_name].php`

Sources of Workflow modules

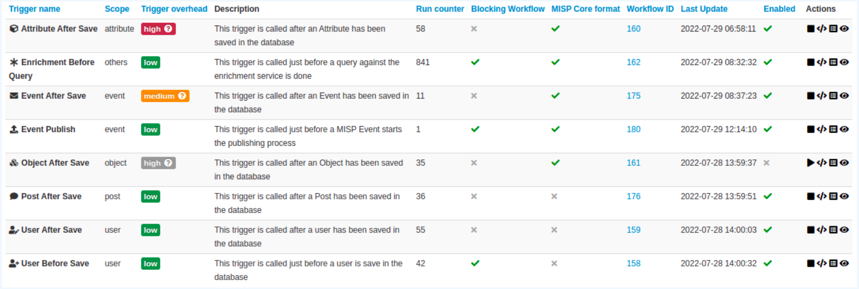
3 sources of action modules

- Modules from the **enrichment service**
  - **Default** and **custom** modules
  - `From the misp-module service`
  - Written in Python
  - Can use any python libraries
  - New `misp-module` module type: `action`

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

Triggers currently available

Currently 8 triggers can be hooked. 3 being **blocking**.



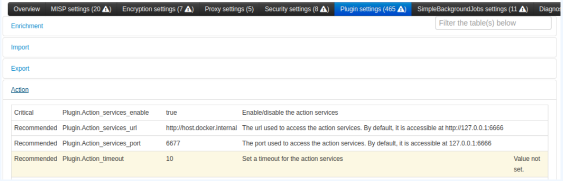
Trigger name	Scope	Trigger overhead	Description	Run counter	Blocking Workflow	MISP Core format	Workflow ID	Last Update	Enabled	Actions
Attribute After Save	attribute	high ?	This trigger is called after an Attribute has been saved in the database	58	✗	✓	160	2022-07-29 06:58:11	✓	■ </> ▤ ◉
Enrichment Before Query	others	low	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	✓	■ </> ▤ ◉
Event Publish	event	low	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 ?	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	low	This trigger is called after a Post has been saved in the database	36	✗	✗	176	2022-07-28 13:59:51	✓	■ </> ▤ ◉
User After Save	user	low	This trigger is called after a user has been saved in the database	55	✗	✗	159	2022-07-28 14:00:03	✓	■ </> ▤ ◉
User Before Save	user	low	This trigger is called just before a user is save in the database	42	✓	✗	158	2022-07-28 14:00:32	✓	■ </> ▤ ◉

Workflow - Getting started

Getting started with workflows (1)

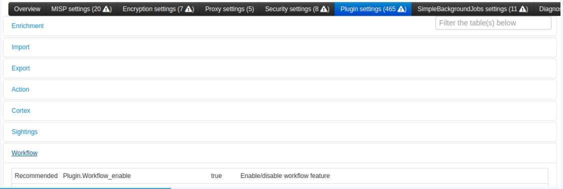
Review MISP settings:

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



Critical	Plugin.Action_services_enable	true	Enable/disable the action services	
Recommended	Plugin.Action_services_url	http://host.docker.internal	The url used to access the action services. By default, it is accessible at http://127.0.0.1:6666	
Recommended	Plugin.Action_services_port	6677	The port used to access the action services. By default, it is accessible at 127.0.0.1:6666	
Recommended	Plugin.Action_timeout	10	Set a timeout for the action services	Value not set.

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



Recommended	Plugin.Workflow_enable	true	Enable/disable workflow feature

Getting started with workflows (2)

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

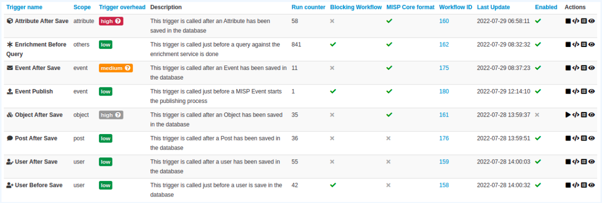
```
# This command should show all `action` modules
$ curl -s http://127.0.0.1:6677/modules | \
jq '.[] | select(.meta."module-type"[] | contains("action")) |
{name: .name, version: .meta.version}'
```

Getting started with workflows (3)

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

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
4. 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!



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Post After Save	post	low	This trigger is called after a Post has been saved in the database	36	×	×	176	2022-07-28 13:59:51	✓	
User After Save	user	low	This trigger is called after a user has been saved in the database	55	×	×	159	2022-07-28 14:00:03	✓	
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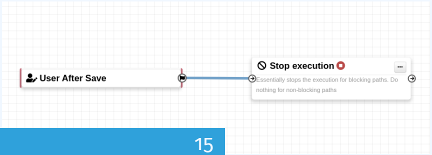
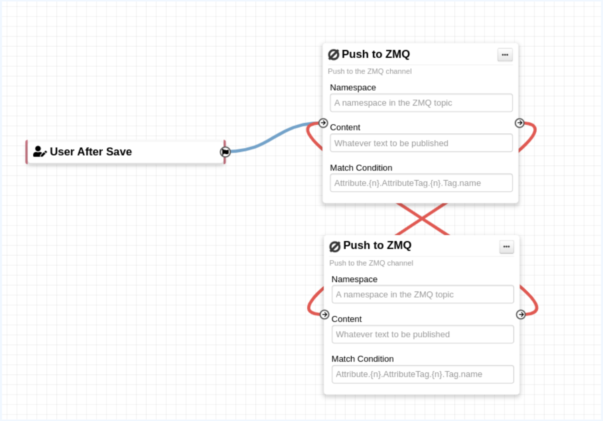

User After Save
Stop execution
Essentially stops the execution for blocking paths. Do nothing for non-blocking paths

Working with the editor

Operations not allowed:

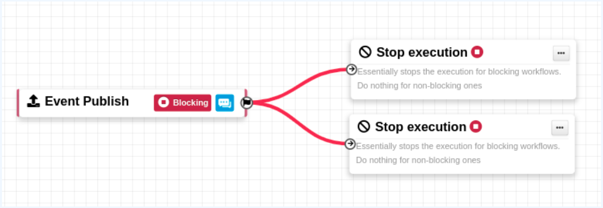
- Execution loop are not authorized
  - Current caveat: If an action re-run the workflow in any way


User After Save
Push to ZMQ
Push to the ZMQ channel
Namespace
A namespace in the ZMQ topic
Content
Whatever text to be published
Match Condition
Attribute.{n}.AttributeTag.{n}.Tag.name
Push to ZMQ
Push to the ZMQ channel
Namespace
A namespace in the ZMQ topic
Content
Whatever text to be published
Match Condition
Attribute.{n}.AttributeTag.{n}.Tag.name

Working with the editor

Operations not allowed:

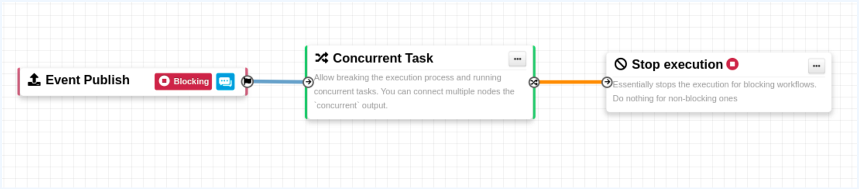
- Multiple connections from the same output
  - Execution order not guaranted and confusing for users


Event Publish
Blocking
Stop execution
Essentially stops the execution for blocking workflows.
Do nothing for non-blocking ones
Stop execution
Essentially stops the execution for blocking workflows.
Do nothing for non-blocking ones

Working with the editor

Operations showing a warning:

- **Blocking** modules after a **concurrent tasks** module

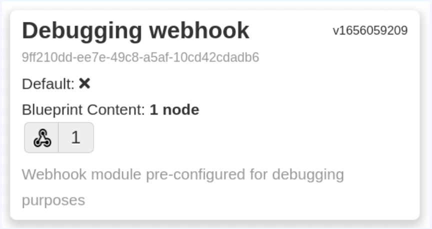


Allow breaking the execution process and running concurrent tasks. You can connect multiple nodes the `concurrent` output.

Essentially stops the execution for blocking workflows. Do nothing for non-blocking ones

Workflow blueprints

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



Debugging webhook v1656059209

9ff210dd-ee7e-49c8-a5af-10cd42cdadb6

Default: ✗

Blueprint Content: **1 node**

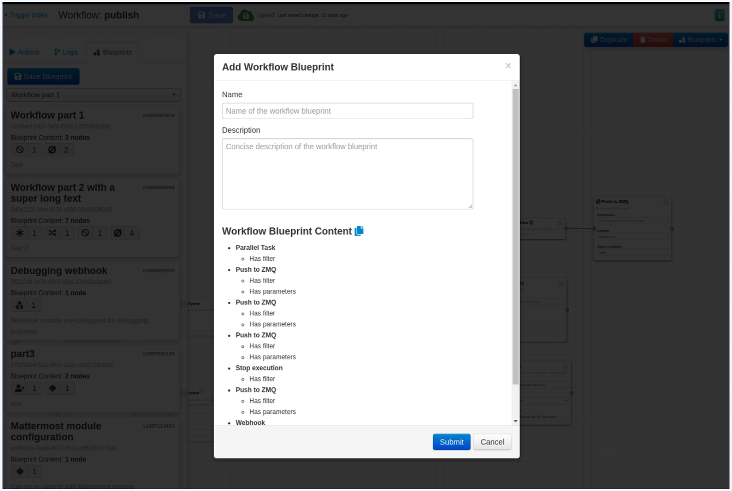
Webhook module pre-configured for debugging purposes

Blueprints origins:

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

Workflow blueprints: Create

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



Workflow part 1 v1655887874
c1f48aef-041c-4e5f-87b8-525f5453c30a
Blueprint Content: **3 nodes**
1 2
Test

Workflow part 2 with a super long text v1655889258
8d9a1126-1fee-4239-a698-83b00d3f6fd5
Blueprint Content: **7 nodes**
1 1 1 4
Test 2

Debugging webhook v1656059209
9ff210dd-ee7e-49c8-a5af-10cd42cdadb6
Blueprint Content: **1 node**
1
Webhook module pre-configured for debugging purposes

part3 v1657030139
879253b4-f92e-493c-a18c-cdd2133b80fe
Blueprint Content: **2 nodes**
1 1
test

Mattermost module configuration v1657112451
ec9b43ca-9aa9-4673-951b-b982d91770a0
Blueprint Content: **1 node**
1
Can be re-used to add Mattermost logging

Add Workflow Blueprint

Name
Name of the workflow blueprint

Description
Concise description of the workflow blueprint

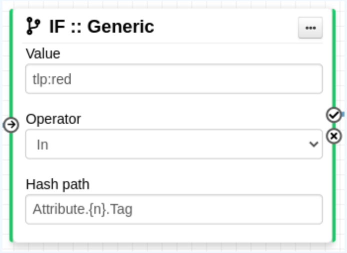
Workflow Blueprint Content

- **Parallel Task**
  - Has filter
- **Push to ZMQ**
  - Has filter
  - Has parameters
- **Push to ZMQ**
  - Has filter
  - Has parameters
- **Push to ZMQ**
  - Has filter
  - Has parameters
- **Stop execution**
  - Has filter
- **Push to ZMQ**
  - Has filter
  - Has parameters
- **Webhook**

Hash path filtering

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

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



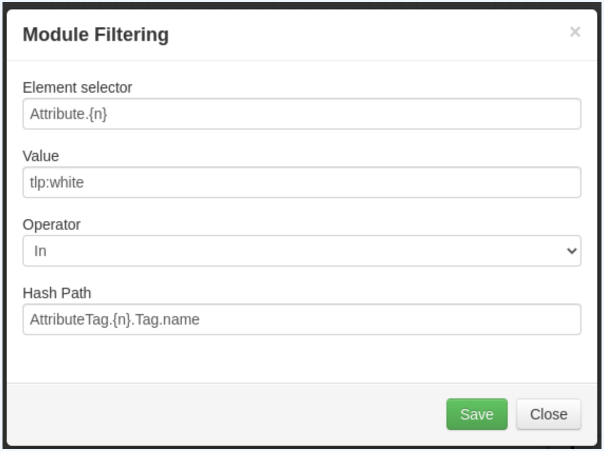
Value: tlp:red

Operator: In

Hash path: Attribute.{n}.Tag

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

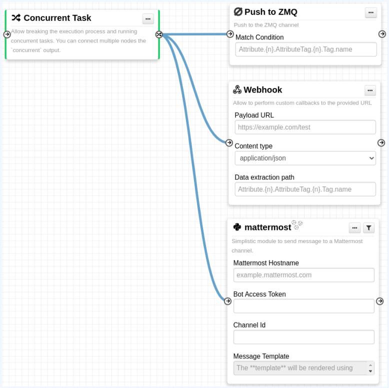
Element selector	Attribute.{n}
Value	tlp:white
Operator	In
Hash Path	AttributeTag.{n}.Tag.name

Data format in Workflows

- 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

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** an ongoing operation anymore



Concurrent Task
Allow breaking the execution process and running concurrent tasks. You can connect multiple nodes the `concurrent` output.

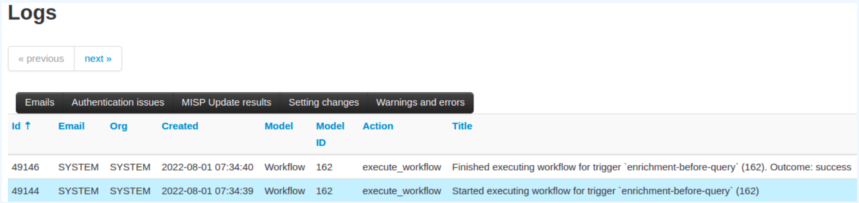
Push to ZMQ
Push to the ZMQ channel
Match Condition: Attribute.{n}.AttributeTag.{n}.Tag.name

Webhook
Allow to perform custom callbacks to the provided URL
Payload URL: https://example.com/test
Content type: application/json
Data extraction path: Attribute.{n}.AttributeTag.{n}.Tag.name

mattermost
Simplistic module to send message to a Mattermost channel.
Mattermost Hostname: example.mattermost.com
Bot Access Token:
Channel Id:
Message Template: The **template** will be rendered using

Debugging Workflows

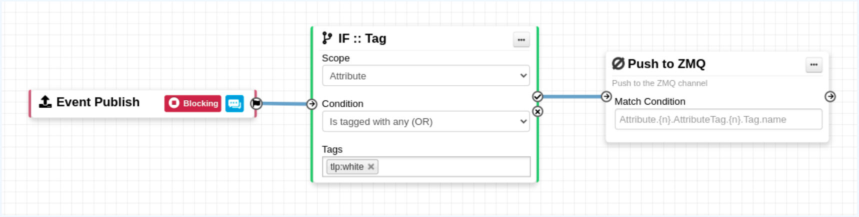
- Workflow execution is logged in the application logs:
  - `/admin/logs/index`
- Or stored on disk in the following file:
  - `/app/tmp/logs/workflow-execution.log`



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)

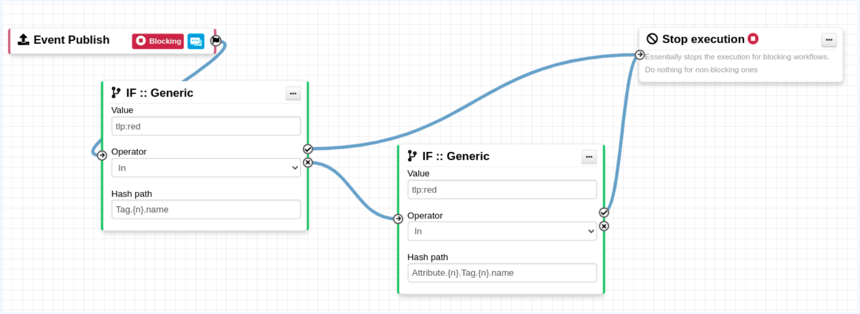
Learning by examples

WORKFLOW EXAMPLE 1



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



Essentially stops the execution for blocking workflows.
Do nothing for non-blocking ones

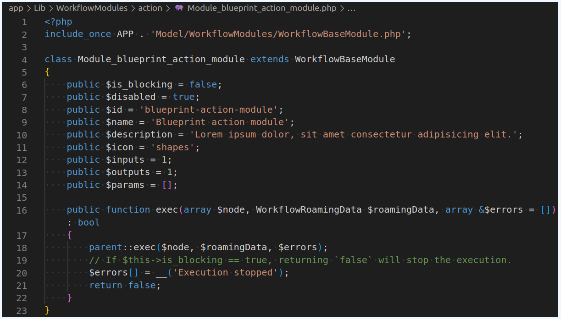
Value: tlp:red
Operator: In
Hash path: Tag.{n}.name

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

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

Extending the system

Creating a new module in PHP


app > Lib > WorkflowModules > action > Module_blueprint_action_module.php > ...

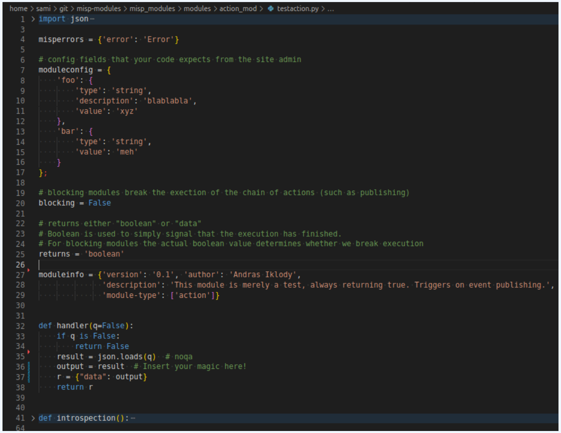
```php
<?php
include_once APP . 'Model/WorkflowModules/WorkflowBaseModule.php';

class Module_blueprint_action_module extends WorkflowBaseModule
{
    public $is_blocking = false;
    public $disabled = true;
    public $id = 'blueprint-action-module';
    public $name = 'Blueprint action module';
    public $description = 'Lorem ipsum dolor, sit amet consectetur adipisicing elit.';
    public $icon = 'shapes';
    public $inputs = 1;
    public $outputs = 1;
    public $params = [];

    public function exec(array $node, WorkflowRoamingData $roamingData, array &$errors = [])
    : bool
    {
        parent::exec($node, $roamingData, $errors);
        // If $this->is_blocking == true, returning `false` will stop the execution.
        $errors[] = __('Execution stopped');
        return false;
    }
}
```

- 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
    - And the module is not blocking, the execution for the current path will be stopped

Creating a new module in Python


home > sami > git > misp-modules > misp_modules > modules > action_mod > testaction.py > ...

```python
import json

misperrors = {'error': 'Error'}

# config fields that your code expects from the site admin
moduleconfig = {
    'foo': {
        'type': 'string',
        'description': 'blablabla',
        'value': 'xyz'
    },
    'bar': {
        'type': 'string',
        'value': 'meh'
    }
};

# blocking modules break the exection of the chain of actions (such as publishing)
blocking = False

# returns either "boolean" or "data"
# Boolean is used to simply signal that the execution has finished.
# For blocking modules the actual boolean value determines whether we break execution
returns = 'boolean'

moduleinfo = {'version': '0.1', 'author': 'Andras Iklody',
              'description': 'This module is merely a test, always returning true. Triggers on event publishing.',
              'module-type': ['action']}


def handler(q=False):
    if q is False:
        return False
    result = json.loads(q)  # noqa
    output = result  # Insert your magic here!
    r = {"data": output}
    return r


def introspection():
```

- 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