Sigma

SIEM Detection Format

Log Hunting with Sigma

A hands-on workshop for Sigma and the pySigma/Sigma CLI toolchain

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Agenda

1. Intro: What is Sigma?
2. Writing a Sigma Rule
3. Sigma Rule Validation
4. Conversion of Sigma Rules into Queries with Sigma CLI
5. Processing Pipelines: Adapting to the Target Environment
6. Creating Custom Output Formats with Query Post-Processing
7. Building Support for new Query Languages: Introduction to Backend Development.
8. The Open Source Sigma Rule Repository

Prerequisites

You need:

- Python 3.8 to 3.11
- Sigma CLI: sigma-cli on PyPI
  - Install with your favorite PIP package manager, e.g.:
    `pipx install sigma-cli`
- Clone of the Sigma workshop repository:
  `git clone https://github.com/SigmaHQ/sigma-workshop.git`
- Internet access 😉

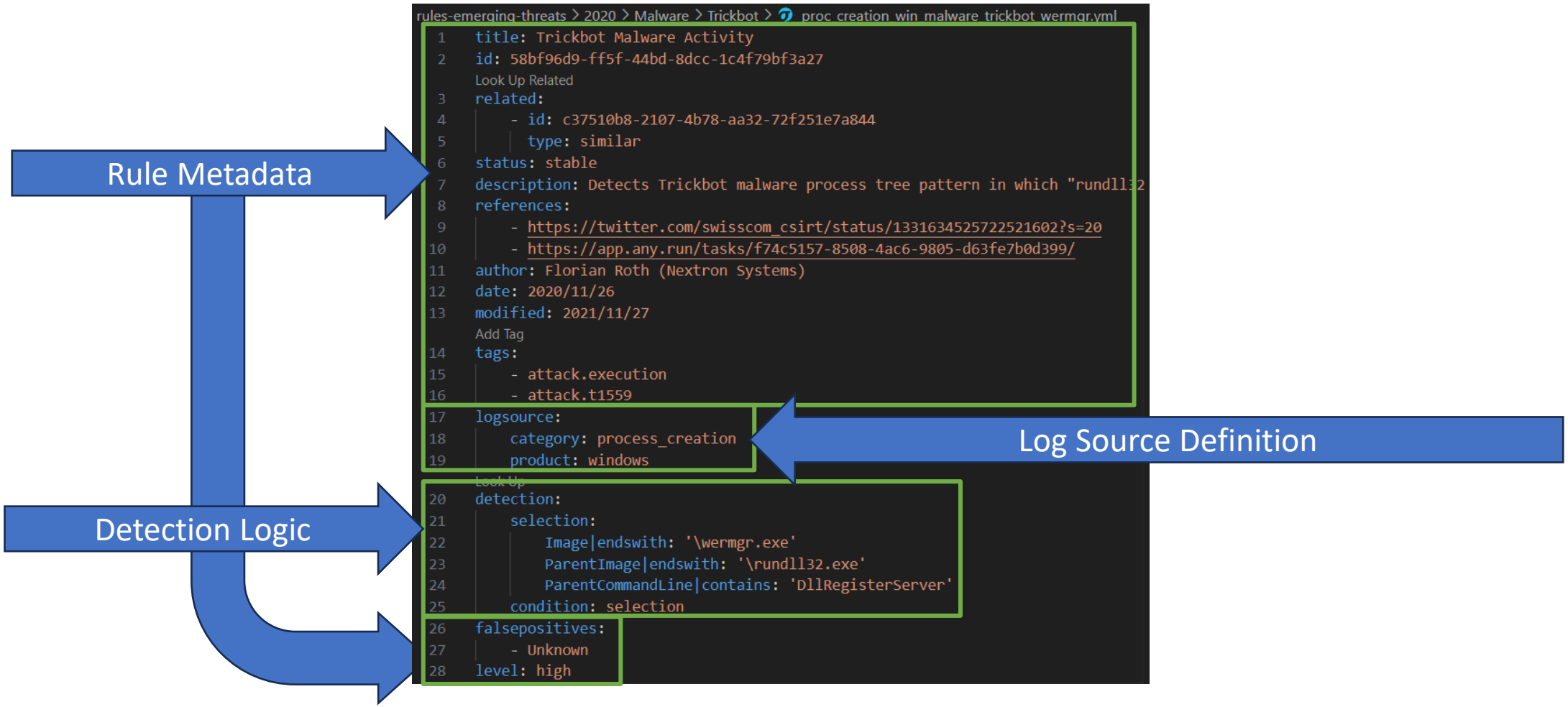
Sigma Goals and Scope

- Human readable/writable
- Machine readable/writable

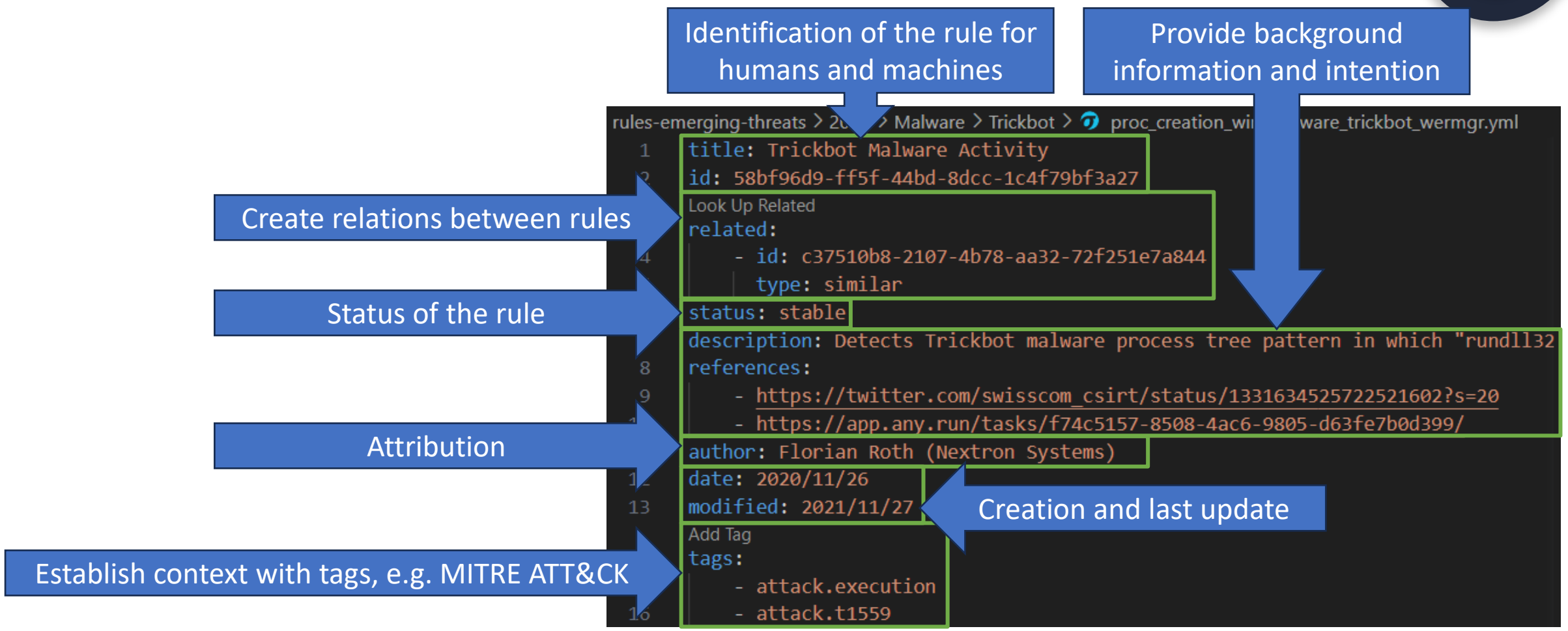
YAML as base format

- Keep it simple stupid
  - Describe log signatures for particular interesting events.
  - Instead of: expression of all imaginable detections and threat hunting techniques.
- Each Sigma rule should be convertible into as much target systems as possible.

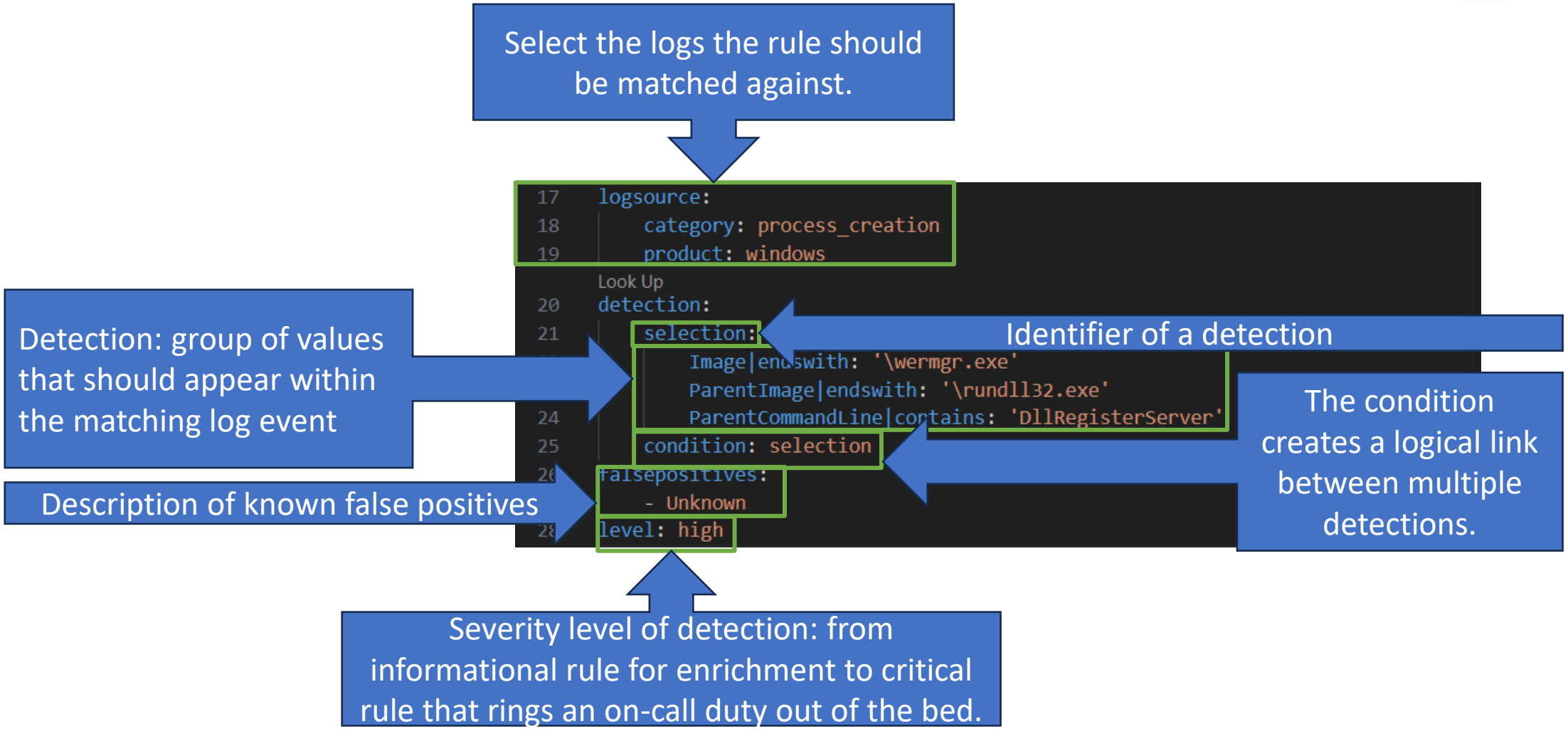
Sigma Rule: Big Picture



Sigma Rule: Metadata



Sigma Rule: Log Source & Detection



Sigma Rule: Condition

- Detections can be logically linked with the condition.
- Usual: exclude legitimate behavior or other known false positives.

```
detection:
    selection:
        cs-method: 'GET'
        c-uri|endswith: '\?manifest=wac'
        cs-host: 'onedrive.live.com'
    filter:
        c-uri|startswith: 'http'
        c-uri|contains: '://onedrive.live.com/'
    condition: selection and not filter
```

How to Write a Sigma Rule?

- Starting points: threat report, sandbox report, incident analysis, observation, …
- Rule creation guide: https://github.com/SigmaHQ/sigma/wiki/Rule-Creation-Guide
- Recommendation: VSCode Sigma extension
- Look after:
  - Unusual process relationships.
  - Unusual parameters, like encoded values.
  - Unusual locations.
  - Events specific to actions like creation of scheduled tasks.

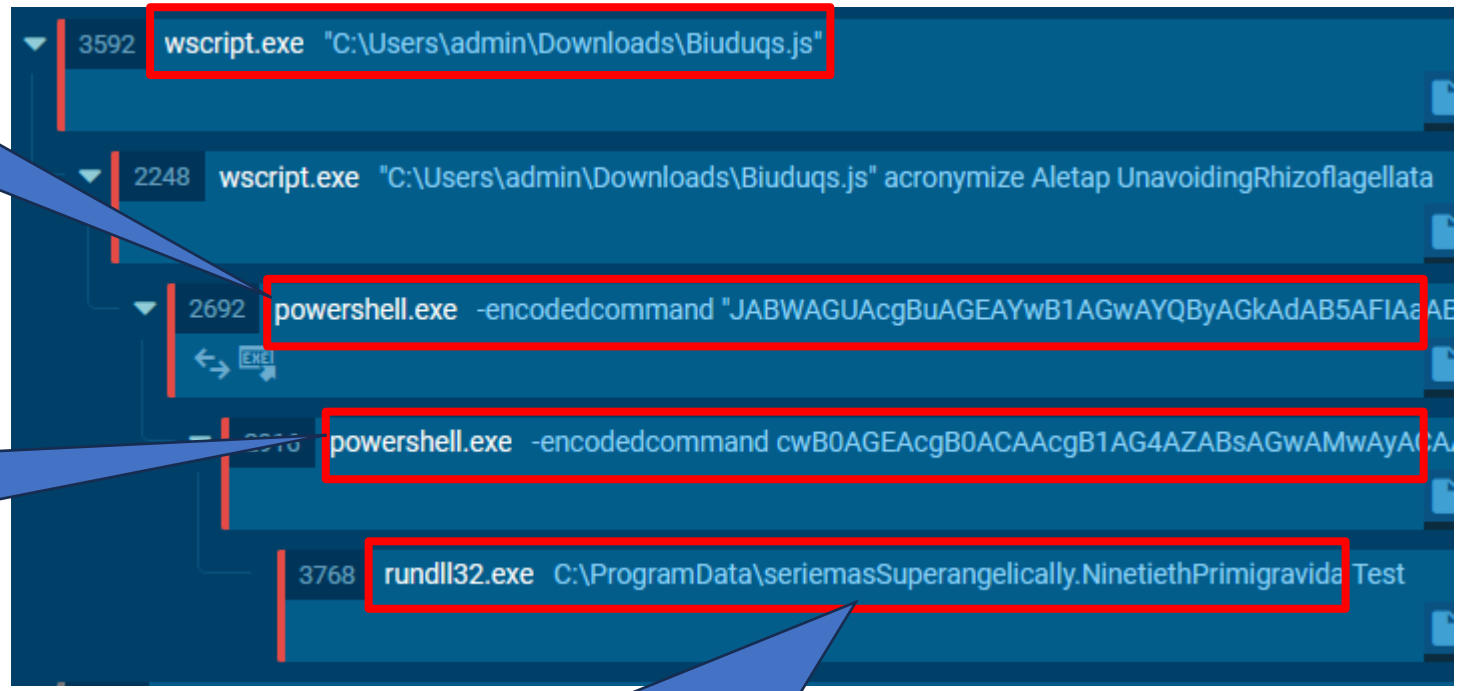
Exercise: Writing Sigma Rules

Pick one of the following sandbox analysis reports and write a Sigma rule that detects the threat:

1. QakBot: https://app.any.run/tasks/91840612-d4bb-4285-b86c-1e389f90156b/
2. QakBot: https://www.joesecurity.org/reports/report-5cb20a0bfc5e3e2ae8398b1840adf7ae.html

Sample 1

JS executed with wscript from users download folder is quite unusual!

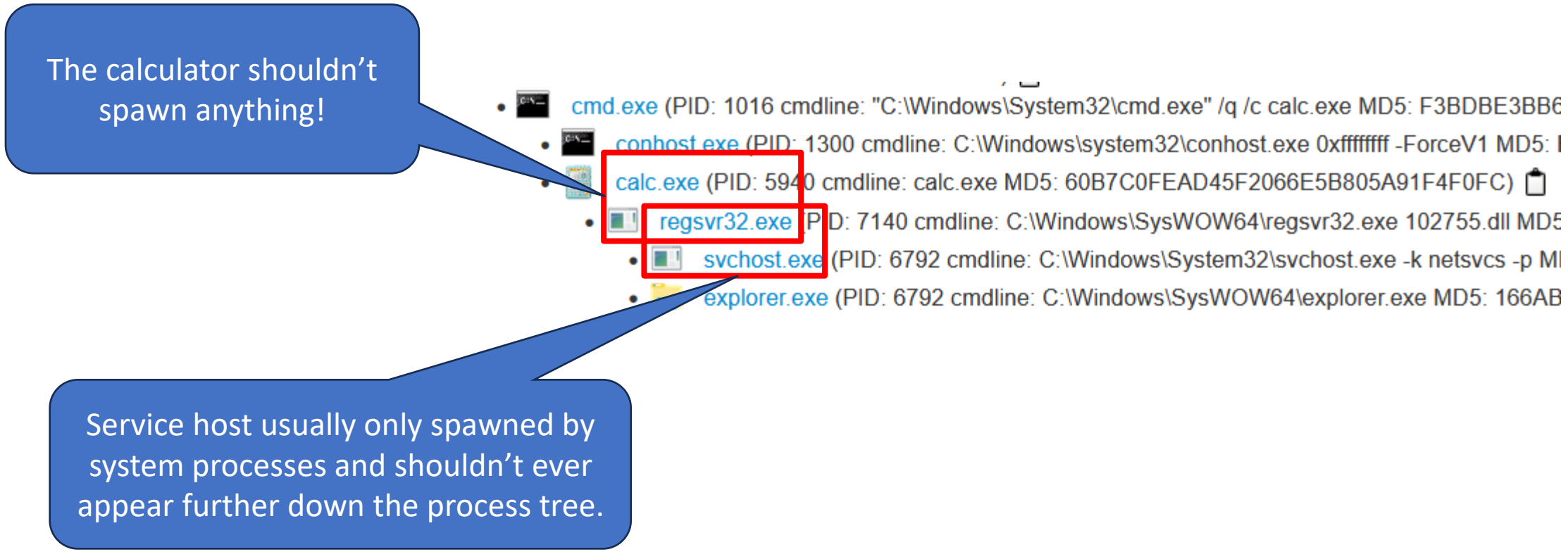


PowerShell with encoded command, but beware of parameter shortening, -enc is also valid! Payload itself contains lots of randomized identifiers.

Same as parent process, but encoded part is “start rundll32 $env:ProgramData\...” and more applicable for a detection.

Rundll without a DLL? Beware: it’s also called sometimes with OCX and others.

Sample 2


The calculator shouldn't spawn anything!
cmd.exe (PID: 1016 cmdline: "C:\Windows\System32\cmd.exe" /q /c calc.exe MD5: F3BDBE3BB6
conhost.exe (PID: 1300 cmdline: C:\Windows\system32\conhost.exe 0xffffffff -ForceV1 MD5:
calc.exe (PID: 5940 cmdline: calc.exe MD5: 60B7C0FEAD45F2066E5B805A91F4F0FC)
regsvr32.exe (PID: 7140 cmdline: C:\Windows\SysWOW64\regsvr32.exe 102755.dll MD5
svchost.exe (PID: 6792 cmdline: C:\Windows\System32\svchost.exe -k netsvcs -p MI
explorer.exe (PID: 6792 cmdline: C:\Windows\SysWOW64\explorer.exe MD5: 166AB
Service host usually only spawned by system processes and shouldn't ever appear further down the process tree.

Example Rule for Sample 1: Script Execution from Download Folder

rules > proc_creation_win_wscript_download_folder.yml

```yaml
title: Execution of Windows Scripting Host with File in Downloads Folder
id: ad41edbd-5a0f-47ae-8f60-a0222866c1c4
status: stable
description: Detects execution of script files from download folder. Often an indicator for malicious droppers.
author: Thomas Patzke
date: 2023/09/11
Add Tag
tags:
    - attack.t1059
logsource:
    category: process_creation
    product: windows
Look Up
detection:
    selection:
        ImageFile|endswith: "\\wscript.exe"
        CommandLine|contains: "\\Downloads\\"
    condition: selection
falsepositives:
    - Unknown
level: high
```

Example Rule for Sample 2: Calculator Spawns a Process

rules > proc_creation_win_calc_spawns_process.yml

```yaml
title: Windows calculator spawns process
id: 34381c6b-9e65-40f8-9270-9e733f8045fa
status: stable
description: Detects if the Windows calculator spawns a process.
    Usually a strong indicator that something injected into it.
author: Thomas Patzke
date: 2023/09/25
```

Add Tag

```yaml
tags:
    - attack.t1055
logsource:
    category: process_creation
    product: windows
```

Look Up

```yaml
detection:
    selection:
        ParentImage|endswith: "\\calc.exe"
    condition: selection
falsepositives:
    - Unknown
level: high
```

Example Rule for Sample 2: Unusual Service Host Parent

release > rules > proc_creation_unusual_svchost_parent.yml

```yaml
title: Service host spawned by unusual process
id: 8f95b6b7-7f35-4f0d-9c6c-7c69d13a0cca
status: experimental
description: Detects Windows service host executions spawned by unusual processes.
author: Thomas Patzke
date: 2023/09/26
```

Add Tag

```yaml
tags:
    - attack.t1055
logsource:
    category: process_creation
    product: windows
```

Look Up

```yaml
detection:
    selection:
        Image|endswith: \\svchost.exe
    legitimate:
        ParentImage|endswith: \\services.exe
    condition: selection and not legitimate
falsepositives:
    - Crashes could possibly different produce process relationships in rare cases.
level: high
```

Rule Validation

- Sigma CLI has built-in Sigma rule validation that checks:
  - Rules for syntactical correctness.
  - Conditions for correctness.
  - Rules for common bad practices or possible improvements.
- Run `sigma check .` To check current directory.

```
$ sigma check .
Parsing Sigma rules  [########################################]  100%
Checking Sigma rules  [########################################]  100%

=== Summary ===
Found 0 errors, 0 condition errors and 0 issues.
No rule errors found.
No condition errors found.
No validation issues found.
```

```
$ sigma check bad
Parsing Sigma rules  [####################################]  100%
Checking Sigma rules  [####################################]  100%
=== Issues ===
issue=InvalidATTACKTagIssue severity=medium description="Invalid MITRE ATT&CK tagging" rules=[C:\Users\thoma\OneDrive\Sigma\2023-Sigma Workshop\Rules\bad\proc_creation_unusual_svchost_parent.yml] tag=attack.t10551
issue=DoubleWildcardIssue severity=low description="String contains multiple consecutive * wildcards" rules=[C:\Users\thoma\OneDrive\Sigma\2023-Sigma Workshop\Rules\bad\proc_creation_unusual_svchost_parent.yml] string=**\services.exe
issue=WildcardInsteadOfEndswithIssue severity=low description="String contains wildcard at beginning instead of being modified with endswith modifier" rules=[C:\Users\thoma\OneDrive\Sigma\2023-Sigma Workshop\Rules\bad\proc_creation_unusual_svchost_parent.yml] detection_item=SigmaDetectionItem(parent=SigmaDetection(parent=ConditionIdentifier(parent=ConditionAND(parent=None, args=[ConditionFieldEqualsValueExpression(parent=..., field='Image', value=(<SpecialChars.WILDCARD_MULTI: 1>, '\\svchost.exe')), ConditionNOT(parent=..., args=[ConditionFieldEqualsValueExpression(parent=SigmaDetectionItem(parent=SigmaDetection(parent=ConditionIdentifier(parent=..., args=['legitimate'], source=None, identifier='legitimate'), detection_items=[...], source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None), item_linking=<class 'sigma.conditions.ConditionAND'>), applied_processing_items=set(), field='ParentImage', modifiers=[], value=[(<SpecialChars.WILDCARD_MULTI: 1>, <SpecialChars.WILDCARD_MULTI: 1>, '\\services.exe')], value_linking=<class 'sigma.conditions.ConditionOR'>, source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None)), field='ParentImage', value=(<SpecialChars.WILDCARD_MULTI: 1>, <SpecialChars.WILDCARD_MULTI: 1>, '\\services.exe'))], source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None))], source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None)), args=['selection'], source=None, identifier='selection'), detection_items=[...], source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None), item_linking=<class 'sigma.conditions.ConditionAND'>), applied_processing_items=set(), field='Image', modifiers=[], value=[(<SpecialChars.WILDCARD_MULTI: 1>, '\\svchost.exe')], value_linking=<class 'sigma.conditions.ConditionOR'>, source=SigmaRuleLocation(path=WindowsPath('bad/proc_creation_unusual_svchost_parent.yml'), line=None, char=None))

=== Summary ===
Found 0 errors, 0 condition errors and 3 issues.
No rule errors found.
No condition errors found.

Validation issue summary:
+-------+-----------------------------+----------+-----------------------------------------------------------+
| Count | Issue                       | Severity | Description                                               |
+-------+-----------------------------+----------+-----------------------------------------------------------+
| 1     | InvalidATTACKTagIssue       | MEDIUM   | Invalid MITRE ATT&CK tagging                              |
| 1     | DoubleWildcardIssue         | LOW      | String contains multiple consecutive * wildcards          |
| 1     | WildcardInsteadOfEndswithIssue | LOW   | String contains wildcard at beginning instead of being    |
|       |                             |          | modified with endswith modifier                           |
+-------+-----------------------------+----------+-----------------------------------------------------------+
```

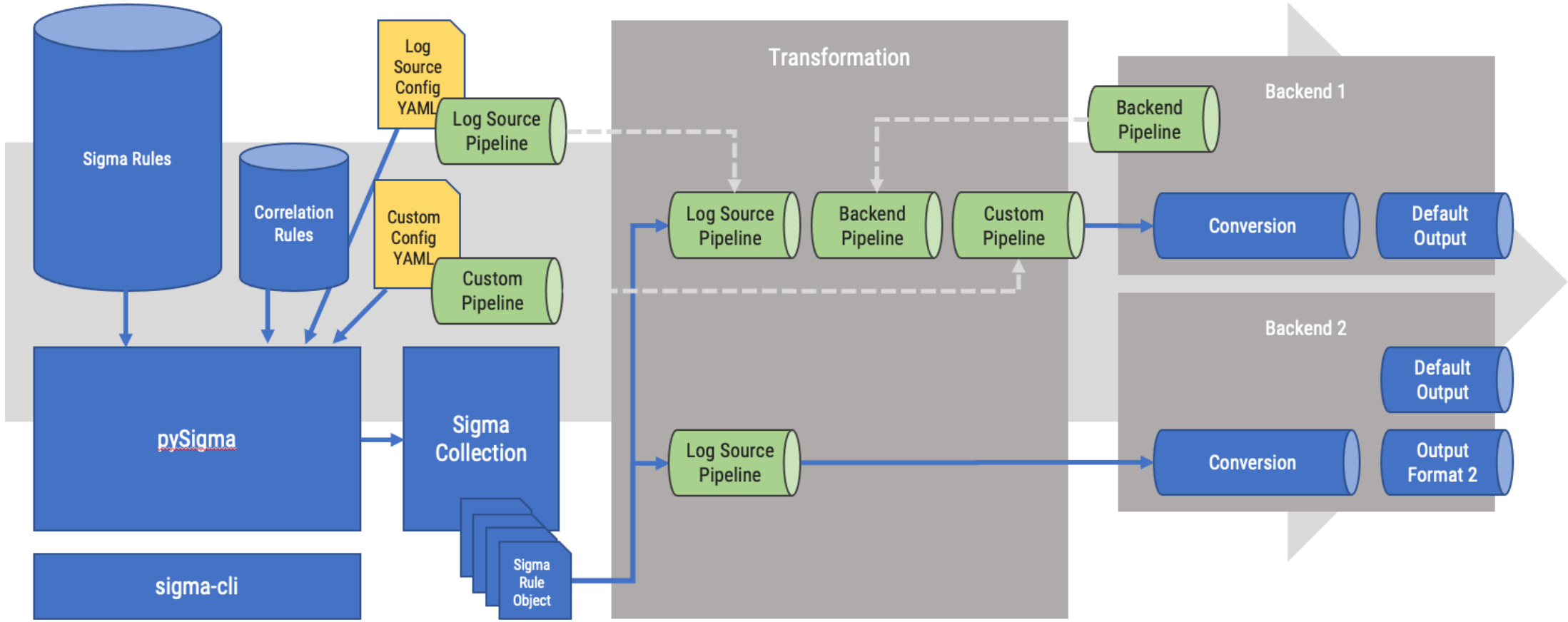
Rule Conversion Concepts

- The Sigma CLI command *convert* converts a Sigma rule into a query.
- The conversion into a *target query language* is conducted with a *backend*.
- The conversion is configured with a *processing pipeline*.
- Backends and processing pipelines are available as *plugins*.
- Custom processing pipelines can be written in YAML format.

```
$ sigma convert -t splunk .
Usage: sigma convert [OPTIONS] INPUT...
Try 'sigma convert --help' for help.

Error:
Processing pipeline required by backend! Define a custom pipeline or choose a predefined one.

Get all available pipelines for splunk with:
sigma list pipelines splunk

If you never heard about processing pipelines you should get familiar with them
(https://sigmahq-pysigma.readthedocs.io/en/latest/Processing_Pipelines.html).
If you know what you're doing add --without-pipeline to your command line to suppress this error.
```

```
$ sigma convert -t elasticsearch .
Usage: sigma convert [OPTIONS] INPUT...
Try 'sigma convert --help' for help.

Error: Invalid value for '--target' / '-t': 'elasticsearch' is not 'splunk'. -
run sigma plugin list --plugin-type backend for a list of available plugins.
```

Rule Conversion Flow



The Sigma CLI Plugin System

- Backends and pipelines are separated from pySigma and the CLI.
- Support for query languages and log sources must be installed.
- Subcommand `sigma plugin` for management of plugins.
- Example:

```
$ sigma plugin install splunk sysmon
Successfully installed plugin 'splunk'
Successfully installed plugin 'sysmon'
```

```
$ sigma plugin
Usage: sigma plugin [OPTIONS] COMMAND [ARGS]...

  pySigma plugin management (backends, processing pipelines and validators).

Options:
  --help  Show this message and exit.

Commands:
  install    Install plugin by identifier or UUID.
  list       List installable plugins.
  uninstall  Uninstall plugin by identifier or UUID.
$ sigma plugin list
+--------------------+---------+--------+-------------------------------------------------------------+-------------+
| Identifier         | Type    | State  | Description                                                 | Compatible? |
+--------------------+---------+--------+-------------------------------------------------------------+-------------+
| ibm-qradar-aql     | backend | stable | IBM QRadar backend for conversion into AQL queries. Contains | yes         |
|                    |         |        | mappings for fields and logsources                          |             |
| cortexxdr          | backend | stable | Cortex XDR backend that generates XQL queries.              | yes         |
| carbonblack        | backend | stable | Carbon Black backend that supports queries for both         | yes         |
|                    |         |        | Enterprise EDR (fka Threat Hunter) and EDR (fka Response)   |             |
| sentinelone        | backend | stable | SentinelOne backend that generates Deep Visibility queries. | yes         |
| sentinelone-pq     | backend | stable | SentinelOne backend that generates PowerQuery queries.      | yes         |
| splunk             | backend | stable | Splunk backend for conversion into SPL and tstats data model | no          |
|                    |         |        | queries as plain queries and savedsearches.conf             |             |
| insightidr         | backend | stable | Rapid7 InsightIDR backend that generates LEQL queries.      | no          |
| qradar             | backend | stable | IBM QRadar backend for conversion into AQL and extension    | yes         |
|                    |         |        | packages.                                                   |             |
| elasticsearch      | backend | stable | Elasticsearch backend converting into Lucene queries, plain, | no          |
|                    |         |        | embedded into DSL or as Kibana NDJSON.                      |             |
| opensearch         | backend | stable | Opensearch backend converting into Lucene queries and       | no          |
|                    |         |        | Opensearch alerting rules.                                  |             |
| ala-socprime       | backend | devel  | Azure Log Analytics backend with Windows log support        | no          |
|                    |         |        | maintained by SOC Prime.                                    |             |
| ala-sifex          | backend | devel  | Azure Log Analytics backend with Windows log support        | yes         |
|                    |         |        | maintained by @sifex.                                       |             |
| stix               | backend | devel  | STIX backend converting into plain STIX queries. Contains   | yes         |
|                    |         |        | mappings for STIX 2.0 and STIX Shifter taxonomies.          |             |
| loki               | backend | stable | Loki backend for conversion into Loki LogQL queries (plain  | no          |
|                    |         |        | and ruler YAML for alerts) and pipelines with mappings for  |             |
|                    |         |        | Grafana and promtail Sysmon data.                           |             |
| windows            | pipeline | stable | Windows logsource to Channel field and generic logsource to | no          |
|                    |         |        | Windows audit events mapping.                               |             |
| sysmon             | pipeline | stable | Mapping from generic log sources to Sysmon events.          | no          |
| crowdstrike        | pipeline | stable | Mapping from generic log sources to CrowdStrike events from | no          |
```

First Conversion

- `sigma list targets` shows available target query languages.
- `sigma list pipelines` shows available processing pipelines.
- `sigma convert -t <target> -p <pipeline> <path>` converts Sigma rules into queries.

```
$ sigma list targets
+------------+-------------------------------------+-----------------------------+
| Identifier | Target Query Language               | Processing Pipeline Required |
+------------+-------------------------------------+-----------------------------+
| lucene     | Elasticsearch Lucene                | Yes                         |
| splunk     | Splunk SPL & tstats data model queries | Yes                      |
+------------+-------------------------------------+-----------------------------+
$ sigma list pipelines
+---------------------------+----------+-----------------------------------------------------------+-------------------+
| Identifier                | Priority | Processing Pipeline                                       | Backends          |
+---------------------------+----------+-----------------------------------------------------------+-------------------+
| crowdstrike_fdr           | 10       | Generic Log Sources to CrowdStrike Falcon Data Replicator | all               |
|                           |          | (FDR) Transformation                                      |                   |
| ecs_windows               | 20       | Elastic Common Schema (ECS) Windows log mappings from     | lucene, opensearch |
|                           |          | Winlogbeat from version 7                                 |                   |
| ecs_windows_old           | 20       | Elastic Common Schema (ECS) Windows log mappings from     | lucene, opensearch |
|                           |          | Winlogbeat up to version 6                                |                   |
| ecs_zeek_beats            | 20       | Elastic Common Schema (ECS) for Zeek using filebeat >= 7.6.1 | lucene, opensearch |
| ecs_zeek_corelight        | 20       | Elastic Common Schema (ECS) mapping from Corelight        | lucene, opensearch |
| splunk_windows            | 20       | Splunk Windows log source conditions                      | splunk            |
| splunk_sysmon_acceleration | 25      | Splunk Windows Sysmon search acceleration keywords        | splunk            |
| splunk_cim                | 20       | Splunk CIM Data Model Mapping                             | splunk            |
| sysmon                    | 10       | Generic Log Sources to Sysmon Transformation              | all               |
+---------------------------+----------+-----------------------------------------------------------+-------------------+
$ sigma convert -t splunk -p sysmon .
Parsing Sigma rules  [####################################]  100%
EventID=1 Image="*\\svchost.exe" NOT ParentImage="*\\services.exe"

EventID=1 ParentImage="*\\calc.exe"

EventID=1 ImageFile="*\\wscript.exe" CommandLine="*\\Downloads\\*"
$ sigma convert -t lucene -p sysmon .
Parsing Sigma rules  [####################################]  100%
EventID:1 AND (Image:*\\svchost.exe AND (NOT ParentImage:*\\services.exe))

EventID:1 AND ParentImage:*\\calc.exe

EventID:1 AND (ImageFile:*\\wscript.exe AND CommandLine:*\\Downloads\\*)
$ sigma convert -t splunk -p crowdstrike_fdr .
Parsing Sigma rules  [####################################]  100%
event_simpleName="ProcessRollup2" ImageFileName="*\\svchost.exe" NOT ParentBaseFileName="services.exe"

event_simpleName="ProcessRollup2" ParentBaseFileName="calc.exe"

event_simpleName="ProcessRollup2" ImageFile="*\\wscript.exe" CommandLine="*\\Downloads\\*"
```

Are the queries ready for usage?

- It is not specified which log is searched. Restriction to a specific index and Windows log source required.
- In Splunk the field *EventID* usually is named *EventCode*.
- In most Splunk setups this query will likely not match any results!

- `EventID=1 Image="*\\svchost.exe" NOT ParentImage="*\\services.exe"`
- `EventID=1 ParentImage="*\\calc.exe"`
- `EventID=1 ImageFile="*\\wscript.exe" CommandLine="*\\Downloads\\*"`

Processing Pipelines Introduction

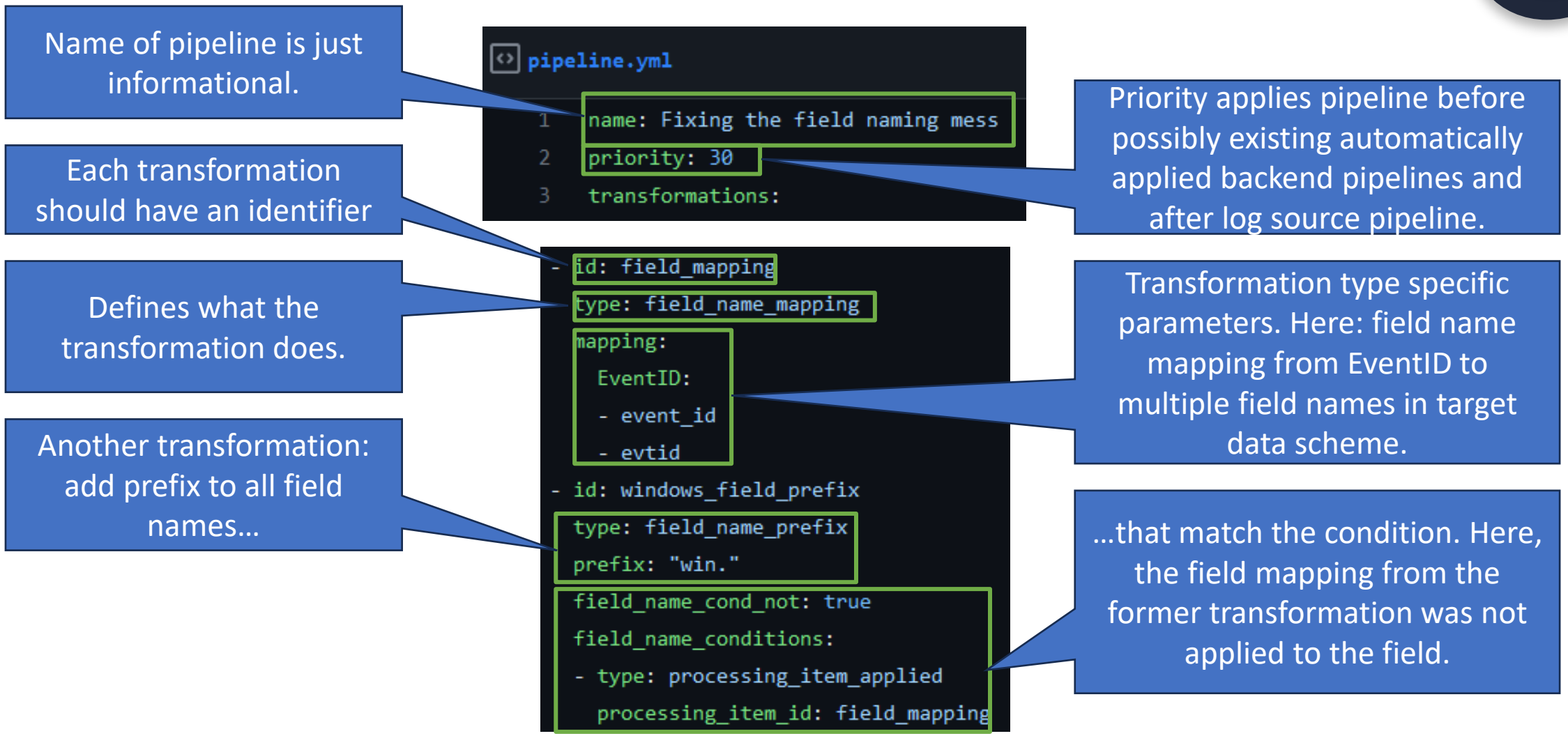
- Processing pipelines can be chained.
- Predefined processing pipeline *splunk_windows* defines log sources and field name mappings.
- Custom processing pipelines can be written in YAML format.
- Usual processing chain:
  log source > target-specific > environment-specific

```
$ sigma convert -t splunk -p sysmon -p splunk_windows .
Parsing Sigma rules  [####################################]  100%
source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
Image="*\\svchost.exe" NOT ParentImage="*\\services.exe"

source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
ParentImage="*\\calc.exe"

source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
ImageFile="*\\wscript.exe" CommandLine="*\\Downloads\\*"
```

Processing Pipeline Basics

- Processing pipeline has a *name*.
- The *priority* determines the order of multiple concatenated processing pipelines.
- There are three stages of processing:
  1. *Rule pre-processing*: transforms the rule before it is converted by the backend into a query. **Examples:** mapping field names, adding conditions.
  2. *Query post-processing*: transforms the query generated from a Sigma rule. Has access to the rule and query. **Example:** embedding query and rule parts into template.
  3. *Output finalization*: works on all post-processed queries to generate a finalized output from this. **Example:** embed queries into file format with header.
- In each stage *transformations* are executed which can be restricted by *conditions*.

Processing Pipeline Example



Exercise:
Writing a Custom Processing Pipeline

- Build a processing pipeline that adds an index condition to each query.
- The *add_condition* transformation is a possible way.

processing_pipelines > ! splunk_customization.yml

```yaml
name: Custom Splunk environment
priority: 30
transformations:
- id: index_condition
  type: add_condition
  conditions:
    index: windows
```

```
$ sigma convert -t splunk -p sysmon -p splunk_windows -p .\processing_pipelines\splunk_customization.yml rules
Parsing Sigma rules  [########################################]  100%
index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 Image="*\\svchost.exe" NOT
ParentImage="*\\services.exe"

index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 ParentImage="*\\calc.exe"

index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 ImageFile="*\\wscript.exe"
CommandLine="*\\Downloads\\*"
```

Custom Output Formats

- Plain query output is sufficient for searching for specific threats once, but not sufficient for continuous detection of threats.
- To operationalize detections the queries must be:
  - *persisted* into a SIEM.
  - *scheduled* to run regularly or continuous.
  - *emit detection events* that can be picked up by case handling or SOAR systems.
- This means that queries must be embedded into data structures that configure the functions mentioned above.
- Processing pipelines allow this in the *query post-processing* and *output finalization* stages.

Post-Processing Stages

1. Starting point: the *pre-processed rule* was converted into a query by the backend.
2. In the *query post-processing* stage the query can be transformed, embedded into a template and enriched with information from the Sigma rule.
3. The *output finalization* stage merges and embeds all *post-processed queries* into a final output.

```
index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
Image="*\\svchost.exe" NOT ParentImage="*\\services.exe"

index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
ParentImage="*\\calc.exe"

index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1
ImageFile="*\\wscript.exe" CommandLine="*\\Downloads\\*"
```

splunk-savedsearches-concat.yml

```
postprocessing:
- type: template
  template: |+
    [{{ rule.id }}]
    search = {{ query }} | eval rule="{{ rule.id }}", title="{{ rule.title }}" | collect index=notable_events
    description = {{ rule.description }}

finalizers:
- type: concat
  prefix: |
    [default]
    cron_schedule = */15 * * * *
    dispatch.earliest_time = -20m@m
    dispatch.latest_time = -5m@m
```

```
[default]
cron_schedule = */15 * * * *
dispatch.earliest_time = -20m@m
dispatch.latest_time = -5m@m
[8f95b6b7-7f35-4f0d-9c6c-7c69d13a0cca]
search = index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 Image="*\\svchost.exe" N
OT ParentImage="*\\services.exe" | eval rule="8f95b6b7-7f35-4f0d-9c6c-7c69d13a0cca", title="Service host spawned by unu
sual process" | collect index=notable_events
description = Detects Windows service host executions spawned by unusual processes.

[34381c6b-9e65-40f8-9270-9e733f8045fa]
search = index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 ParentImage="*\\calc.exe
" | eval rule="34381c6b-9e65-40f8-9270-9e733f8045fa", title="Windows calculator spawns process" | collect index=notable
_events
description = Detects if the Windows calculator spawns a process. Usually a strong indicator that something injected in
to it.

[ad41edbd-5a0f-47ae-8f60-a0222866c1c4]
search = index="windows" source="WinEventLog:Microsoft-Windows-Sysmon/Operational" EventCode=1 ImageFile="*\\wscript.ex
e" CommandLine="*\\Downloads\\*" | eval rule="ad41edbd-5a0f-47ae-8f60-a0222866c1c4", title="Execution of Windows Script
ing Host with File in Downloads Folder" | collect index=notable_events
description = Detects execution of script files from download folder. Often an indicator for malicious droppers.
```

Exercise:
Create a Post-Processing Pipeline

Create a Splunk savedsearches.conf file (https://docs.splunk.com/Documentation/Splunk/9.1.0/Admin/Savedsearchesconf) with the following properties:

- All searches are scheduled each 15 minutes and search logs in a window from 5 to 20 minutes before.
- Each hit is enriched with the rule ID (rule.id) and its title (rule.title).
- All enriched hits are written into an index *notable_events*.

Possible Solutions for the Post-Processing Pipeline

Embedding the rule identifier as query identifier.

This section defines the *query post-processing* stage transformations, here embedding the query and rule parts into a template

Enriching the matched event with rule metadata provides context to the analysts who are handling the event.

The query generated by the backend is embedded here.

Use the rule description as description for the saved query.

Write enriched event into an index to be picked up by a SOAR or ticketing system.

Definition of the *output finalization* stage tranformations. Here it's a simple concatenation of all post-processed queries with a prefix for the whole output.

The static prefix defines the scheduling and search window for all queries.

splunk-savedsearches-concat.yml

```
1  postprocessing:
2  - type: template
3    template: |+
4      [{{ rule.id }}]
       search = {{ query }} | eval rule="{{ rule.id }}", title="{{ rule.title }}" |
5      collect index=notable_events
6      description = {{ rule.description }}

8  finalizers:
9  - type: concat
10   prefix: |
11     [default]
12     cron_schedule = */15 * * * *
13     dispatch.earliest_time = -20m@m
14     dispatch.latest_time = -5m@m
```

Advanced Post-Processing

- pySigma uses Jinja2 as templating language. This enables:
  - Filtering and transforming values in the template
  - Conditionals:
    - Additional actions like sending out mails or push notifications on critical severity matches.
    - Different scheduling and search windows for different log sources. Real-time ingested logs vs delayed ingestion in batches.
- Processing pipeline including variables is accessible. Use this to configure post-processing outside of the template.
- Idea: HTTP API transformation to directly interface to SIEMs and EDRs.

Supporting new Query Languages with a Custom Backend

- Problem: Your query language is not yet supported by a backend.
- Solution: Create a new backend.
- This requires some Python development.
- In many cases you don‘t need to dive deep into Python code but only to declare tokens and properties of the query language.
- There‘s a backend template: https://backend-template.sigmahq.io

Using the Template

- The project‘s dependencies and packaging will be managed by Poetry. Install it:
  `pipx install poetry`
- It‘s a cookiecutter template, so you need to install cookiecutter:
  `pipx install cookiecutter`
  or
  `python3 -m pip install --user cookiecutter`
- When cookiecutter is ready clone the template with:
  `cookiecutter https://github.com/SigmaHQ/cookiecutter-pySigma-backend.git`

Backend Creation from Template

Most of these values are derived from target_name. Usually the default values are sufficient and can simply be confirmed.

This should be a well-considered selection because the license impacts the usability as well as how others changes have to be contributed back.

You can also use a different license than offered here. Just replace the license references in your backend.

```
$ cookiecutter https://github.com/SigmaHQ/cookiecutter-pySigma-backend.git
target_name [Target query language name]: Foobar
backend_package_name [foobar]:
backend_name [Foobar]:
backend_class_name [FoobarBackend]:
Select package_type:
1 - backend
2 - pipeline
Choose from 1, 2 [1]:
package_name [pySigma-backend-foobar]:
package_description [pySigma Foobar backend]
author [Thomas Patzke]:
email [thomas@patzke.org]
Select license:
1 - LGPL-3.0-only
2 - MIT
3 - Apache-2.0
Choose from 1, 2, 3 [1]:
github_account [SigmaHQ]:
test_badge [True]:
coverage_badge [True]:
coverage_gist [GitHub Gist identifier containing coverage badge JSON expecte
d by shields.io.]: xxx
status_badge [True]:
Select status:
1 - pre--release-orange
2 - release-green
Choose from 1, 2 [1]:
additional_output_formats [False]:
output_formats [format1,format2]:
Using version ^0.10.5 for pysigma
```

This is the most important value, choose it wisely!

Change these unless we share the same name or you're a clone of me 😉

Lots of details: where will your backend be hosted? Test status, coverage and project status badges. Output formats (use post-processing where possible!).

The template setups the backend source

Backend Structure

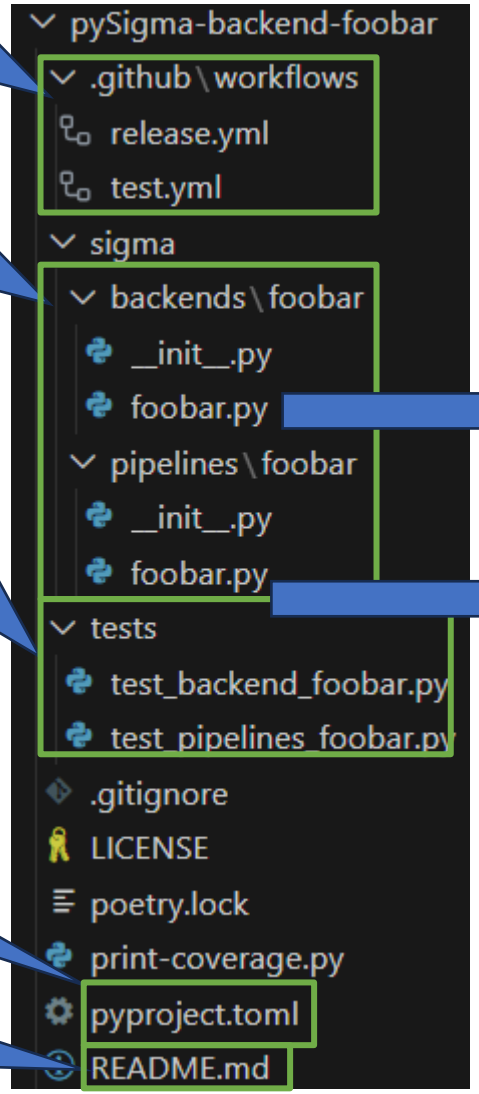
GitHub Actions configuration for CI testing and PyPI release.

The core of your backend! Open these and implement it here.

CI tests implemented with pyTest. Strong recommendation to implement them!

Project metadata: dependencies, license etc.

Likely the first thing people will see. Put some work into it.




```python
class FoobarBackend(TextQueryBackend):
    """Foobar backend."""
    name : ClassVar[str] = "Foobar backend"
    formats : Dict[str, str] = {…
    requires_pipeline : bool = False

    precedence : ClassVar[Tuple[ConditionItem, Cond
    group_expression : ClassVar[str] = "({expr})"

    # Generated query tokens
    token_separator : str = " "     # separator
    or_token : ClassVar[str] = "OR"
    and_token : ClassVar[str] = " "
    not_token : ClassVar[str] = "NOT"
    eq_token : ClassVar[str] = "="  # Token inserte
```

Implement your query language by providing the tokens and configuration. You can also override methods to implement advanced behavior.

```python
@Pipeline
def foobar_pipeline() -> ProcessingPipeline:        # Processing pipelines should
    return ProcessingPipeline(
        name="Foobar example pipeline",
        allowed_backends=frozenset(),
        priority=20,            # The priority defines the order pipelin
        items=[
            ProcessingItem(     # This is an example for processing items gener
                identifier=f"foobar_windows_{service}",
                transformation=AddConditionTransformation({ "source": source}),
                rule_conditions=[logsource_windows(service)],
            )
            for service, source in windows_logsource_mapping.items()
        ] + [
            ProcessingItem(     # Field mappings
                identifier="foobar_field_mapping",
                transformation=FieldMappingTransformation({
                    "EventID": "event_id",      # TODO: define your own field map
                })
            )
        ],
```

Processing pipelines are implemented as Python code. Advantages: looping over log sources, efficiency etc. Results in the same data structure as if written in YAML.

Integrating the new backend into pySigma and Sigma CLI

- By default the backend is set up as Python package that can be installed into a Sigma CLI virtual Python environment.
- If you installed it with pipx use:
  `pipx inject sigma-cli <path to your backend source directory>`
- If you are otherwise in an activated Python virtual environment with installed Sigma CLI use:
  `pip install <path to your backend source directory>`
- Try if it works. After changes to the backend source code you have to reinstall it in your Sigma CLI virtual Python environment with the above commands.

Publishing your backend

- Your backend works? Great! Consider publishing it as open source project 🚀
- Ideally: PyPI package because you can define clear releases.
- It‘s also possible to install backends from a public source location.
- Sigma CLI (and hopefully other tools) can find backend by the pySigma plugin directory: https://pysigma-plugin-directory.sigmahq.io
- Create a pull request with a description of your plugin in the directories JSON.


```
"4af37b53-f1ec-4567-8017-2fb9315397a1": {
    "id": "splunk",
    "type": "backend",
    "description": "Splunk backend for conversion into SPL and tstats data model queries as plain queries and savedsearches.conf",
    "package": "pysigma-backend-splunk",
    "project-url": "https://github.com/SigmaHQ/pySigma-backend-splunk",
    "report-issue-url": "https://github.com/SigmaHQ/pySigma-backend-splunk/issues/new",
    "state": "stable",
    "pysigma-version": "~=0.10.3"
},
```

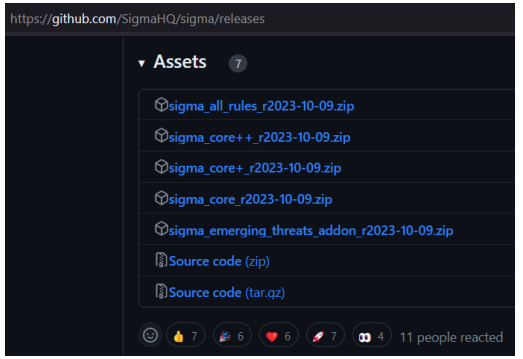
The Open Source Sigma Rule Repository

- URL: https://rules.sigmahq.io
- Rules are DRL-licensed (Detection Rule License): use as you want, even commercially. Just mention the rule author in a visible way (UI, not hidden in some text files on the hard disk).
- All contributions are automatically and manually checked against common bad practices, high detection count on clean system logs and much more.
- Rule packages for different purposes are offered as releases.
- Some statistics (averages): 15k clones/day, 150 unique cloners/day, 15k viewers/day and 1k visitors/day

Rule Packages

Base:

- Core: high quality+confidence, low FP ratio. Severity >= high, Status testing or stable.
- Core+: includes medium severity rules. Tuning needed.
- Core++: includes experimental rules. More FPs.



Add-on:

- Emerging Threats: specific current threats, low FP ratio.
- All Rules: All rules with severity >= medium and status from experimental. High FP ratio.

Common Mistakes

- **Using detection rules without ingesting the corresponding logs** is just as pointless as it sounds. Sigma itself don't detects anything and don't provides any logs.
- **Ingesting all rules into your SIEM** will certainly destroy it. Choose carefully according to existing detection gaps, realistic threats and what you and your SIEM are able to handle.
- **Alerting on each Sigma rule match** will certainly destroy your analysts. Not all rules are intended for detection, some are more suitable for highlighting interesting events in log analysis. Look at the severity, use Sigma rule packages!
- **Applying the wrong or no processing pipelines** will result in no detections because generated queries don't match anything. Conversion must be configured properly and tested!

Further Resources

- Sigma website: https://sigmahq.io
- Rule repository: https://rules.sigmahq.io
- Sigma CLI: https://cli.sigmahq.io
- Web Converter: https://sigconverter.io/
- Sigma training by Applied Network Defense: https://www.networkdefense.co/courses/sigma/

SigmaHQ

Rules

CLI

SigConverter

AND Training

Want to Support Sigma?

- Contribute rules to the rules repository.
  - Most simple way: update rule status to stable if you use it in production.
  - Add known false positives: https://fp.sigmahq.io
  - Add rules for new or missing threats.
- Provide feedback on rules and code by opening GitHub issues or pull requests.
- Contribute backends and pipelines.
- Contribute to pySigma or Sigma CLI.
  - Please reach out before implementing new features. Some good ideas are intentionally not implemented for good reasons.
- Sponsor:
  - https://github.com/sponsors/thomaspatzke
  - Check out Sigma-related projects like backends etc. for further sponsoring opportunities!

The End!

Follow-up questions? Contact me:

- thomas@patzke.org
- https://infosec.exchange/@thomaspatzke

Please give feedback: https://forms.office.com/r/xJA3PjMfYh

Sponsor my work on Sigma with GitHub Sponsors:
https://sponsor.sigmahq.io