# ThreatQuotient

## ThreatQ Splunk Guide

Version 2.2.0

Thursday, January 14, 2021

**ThreatQuotient**

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### Support

| | |
|---|---|
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# Contents

# Versioning

## App Version

- TA-threatquotient-add-on:2.3.0
- ThreatQAppforSplunk:2.2.0

## Supported Splunk Version

These apps have been tested with Splunk versions Splunk 7.2.x, Splunk 7.3.x, Splunk 8.X (Python 2), Splunk 8.X (Python 3).

## Supported ThreatQuotient Version

These apps require ThreatQ version 4.16.0 or higher. They will NOT work with a ThreatQ version prior to 4.16.0.

# Features

The ThreatQuotient App for Splunk provides the following capabilities:

## Distributed Deployment

The solution is packaged as two separate Splunk packages:

| Package | Description |
|---|---|
| ThreatQuotient Add-on for Splunk | Deployed on Splunk heavy forwarder and search head. |
| ThreatQuotient App for Splunk | Deployed on Splunk search head. |

## Support for Splunk's Common Information Model (CIM) and Enterprise Security (ES)

| Support | Description |
|---|---|
| CIM Support | For users who map third party data (firewall events, logs for example) to Splunk's data models in CIM. This App provides optimized performance by leveraging those data models. |
| ES Support | Indicator data exported from ThreatQ is mapped to lookup tables native to Splunk ES. Threat Intelligence support for Enterprise Security is provided using its REST APIs. |

## Export Indicators from ThreatQ using Score and Status Filters

| Package | Description |
|---|---|
| Score Filter | You can choose to export indicators with scores greater than or equal to the value configured in the score filter. |
| Status Filter | You can choose to export indicators with statuses matching the ones configured in the status filter. |

# Detect Sightings and Return to ThreatQ

| Package | Description |
|---|---|
| Detect Sightings | Indicators from ThreatQ are matched against raw events in Splunk looking for evidence of sightings. |
| Report Sightings | Sightings are reported back to ThreatQ as events that contain the most up to date information. |

# Contextualize ThreatQ Data

All data exported from ThreatQ is highly contextualized for Splunk. Context provided for exported indicators includes:

- Indicator sources
- Indicator adversaries
- Indicator attributes
- Indicator status, score and type

# Workflow Actions in Splunk to Interact with ThreatQ Data

***Note:*** *Workflow actions are only available for fields that are configured to be extracted. Additional fields can be configured for extraction by clicking **Event Actions -> Extract Fields**.*

This App provides the following workflow actions to an analyst to interact with ThreatQ:

- Add Indicator to ThreatQ
    - The user provides indicator type, status and source
- Whitelist an indicator in ThreatQ
- Look up an indicator in ThreatQ
    - Additional context is fetched if this indicator exists in ThreatQ
- Mark an indicator **False Positive** in ThreatQ
- Mark an indicator **True Positive** in ThreatQ

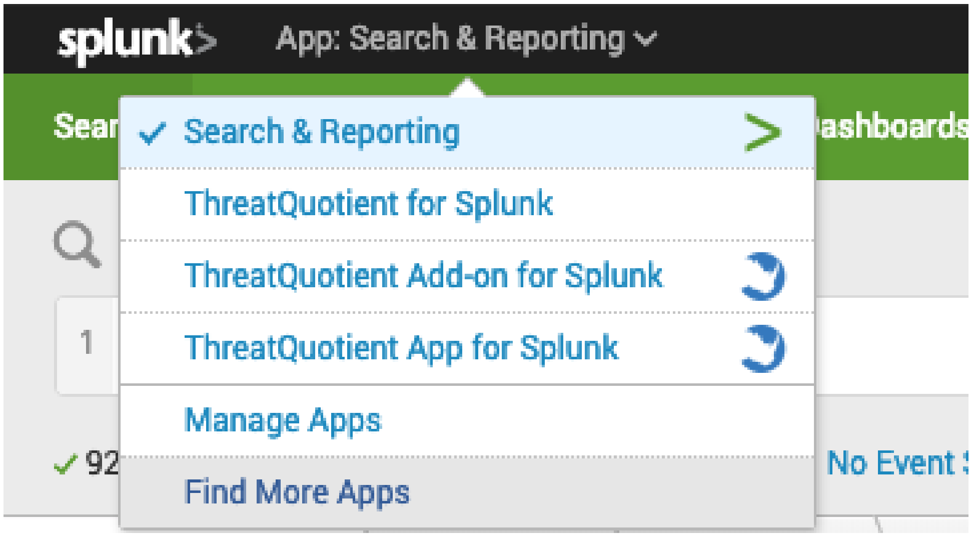
# Dashboard for Visualization

The dashboard provides a rich set of real time updated widgets and tables to summarize information, including (but not limited to):

- Total exported indicators and sightings filtered by time range, type and score
- Top 10 indicators with sightings
- Top 10 sources and adversaries (due to the context available from ThreatQ) with sightings
- Static tables summarizing indicators and sightings filtered by time range, type and score

# Installation

1. Click on the **Down** arrow on the Apps menu located in the main navigation bar.
2. Select the **Find More Apps** option.



3. Search for “ThreatQuotient” and follow the onscreen prompts to install the ThreatQuotient App and ThreatQuotient Add-on.

# Upgrading

The ThreatQ Splunk App Version 2.1.0 introduced several key improvements and updates that require user action upon upgrade.

### KV Store

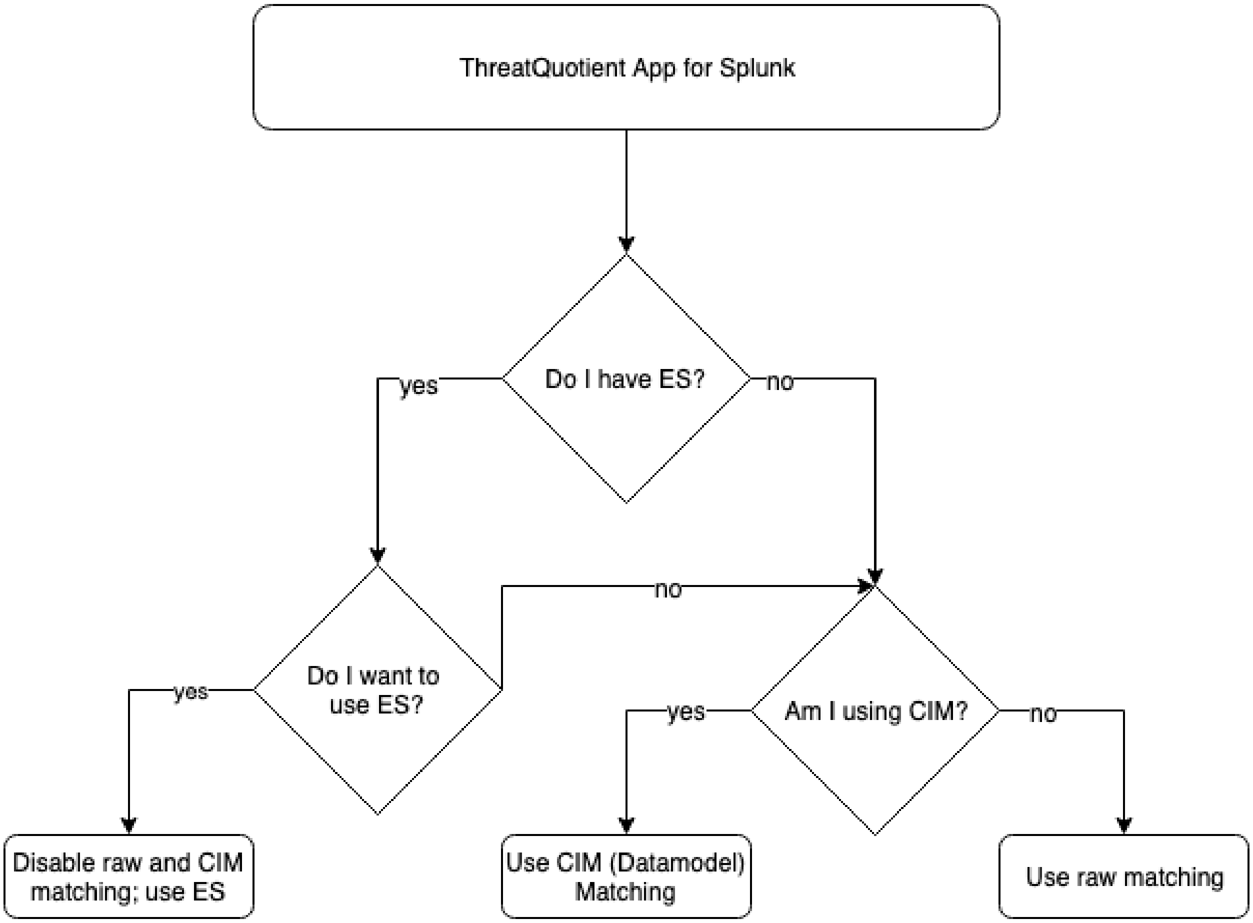
Upon upgrade to version 2.1.0, ThreatQ data will be directly stored to the KVStore opposed to a designated index. After the upgrade process completes, users are required to complete the Splunk KVStore Rest configuration form, found under the Configuration section. Users can continue to store data in the index or update the input configuration to disable it.

### Scoring and Status Threshold Configurations

With ThreatQ Splunk App version 2.1.0 release, `threatq_score_filter` and `threatq_status_filter` macro configurations are no longer available. The thresholds for score and status can be configured on the input and those values will determine what data gets added to ThreatQ app for Splunk and the index (if enabled).

# App Usage

This App can be used in one of three possible modes. Follow the flow diagram below to determine which mode to use.


ThreatQuotient App for Splunk
Do I have ES?
yes
no
Do I want to use ES?
yes
no
Am I using CIM?
yes
no
Disable raw and CIM matching; use ES
Use CIM (Datamodel) Matching
Use raw matching

| Modes | Description |
|---|---|
| Raw Matching Mode | RawMatchingMode:ThismodeisapplicableifyoudonothaveSplunkEnterprise Security (ES) and do not map your traffic to Splunk's CIM. In this mode, the App treats all events as raw binary data and looks for evidence of sightings inside said data using optimized regexes. For the expected performance data, see the tables in Performance. |
| CIM Matching Mode | Sometimes referred to as **Datamodel Match Mode**, this mode should be used by users who do not wish to use Enterprise Security (ES), but do map their traffic using Splunk's CIM. In this mode, the app uses the mapping table |

| | |
|---|---|
| | described in CIM Support to find evidence of sightings and report matches back.  This form of matching is more optimized since the algorithm can now reference well known fields in standard data models instead of looking for matches in the whole binary data. |
| Enterprise Security | This mode is applicable to the users who want to use Enterprise Security for their end to end workflow, and simply want to get the threat data in ES. In this mode, you do not use any capability of the ThreatQuotient App, and instead rely on Enterprise Security to find and report on evidence of sightings. |

# Deployment

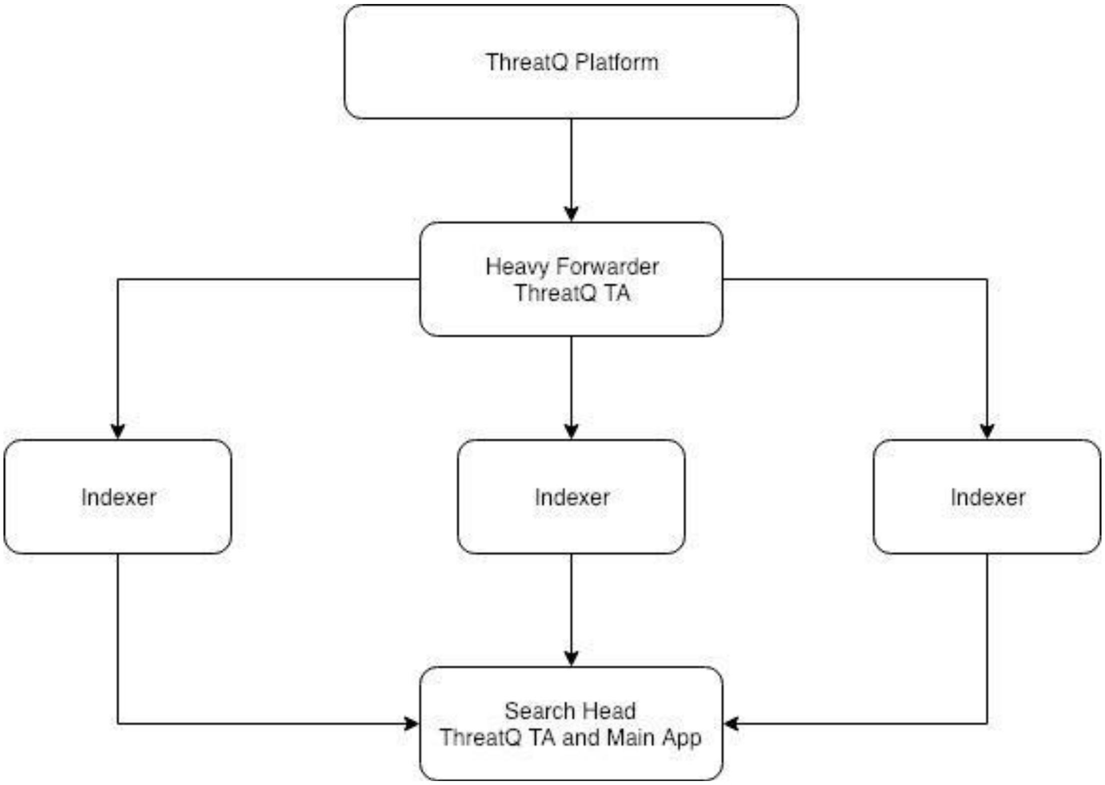
Two Splunk packages need to be deployed for the App to work.

| Package | Description |
|---|---|
| TA-threatquotient-add-on | This package needs to be deployed both on the Splunk heavy forwarder and Splunk search head.<br>• On the heavy forwarder, the add-on App extracts indicators from the ThreatQ appliance and forwards them to the configured Splunk index.<br>• On the search head, the App provides support for ThreatQuotient workflow actions in Splunk. |
| ThreatQAppforSplunk | This package needs to be deployed only on the Splunk search head. |

There are two ways in which both Apps can be deployed in Splunk:

| Method | Description |
|---|---|
| Standalone Mode | In this mode, both Apps are deployed and configured on the same machine. |
| Distributed Mode | In this mode, deployment is done as described in the image below. |

### Deployment of Splunk App in Distributed Environment



For a distributed environment with a **cluster of search heads**, you will need to configure the ThreatQuotient Add-on App on the master node and use the Splunk App deployer to propagate that configuration to all nodes. For the heavy forwarder, it is **not recommended** that you deploy the Add-on app on a cluster, since the data extraction takes place with a custom script, and works the best with a single node

The table below summarizes the deployment in the distributed Splunk environment:

**Deployment Matrix for Distributed Environment**

| App | Heavy Forwarder | Indexer | Search Head |
|---|---|---|---|
| ThreatQuotient Add-on | Yes<br>Requires configuration with ThreatQuotient credentials.<br>Requires creating the data collection job. | No | Yes<br>• Requires configuration with ThreatQuotient credentials.<br>• **Must not be** configured with data collection job. |
| ThreatQuotient App | No | No | Yes<br>• No configuration is required. |

### Advanced Configuration

If you desire to configure multiple heavy forwarders for a single ThreatQuotient App - this is not typical since the indicators exported from ThreatQ do not exceed a few thousand at most - you would have to make multiple copies of the default ThreatQ Splunk Export, and use a different Export ID on each heavy forwarder. This way, the ThreatQ server can keep track of incremental indicator changes as seen by each distinct Export.

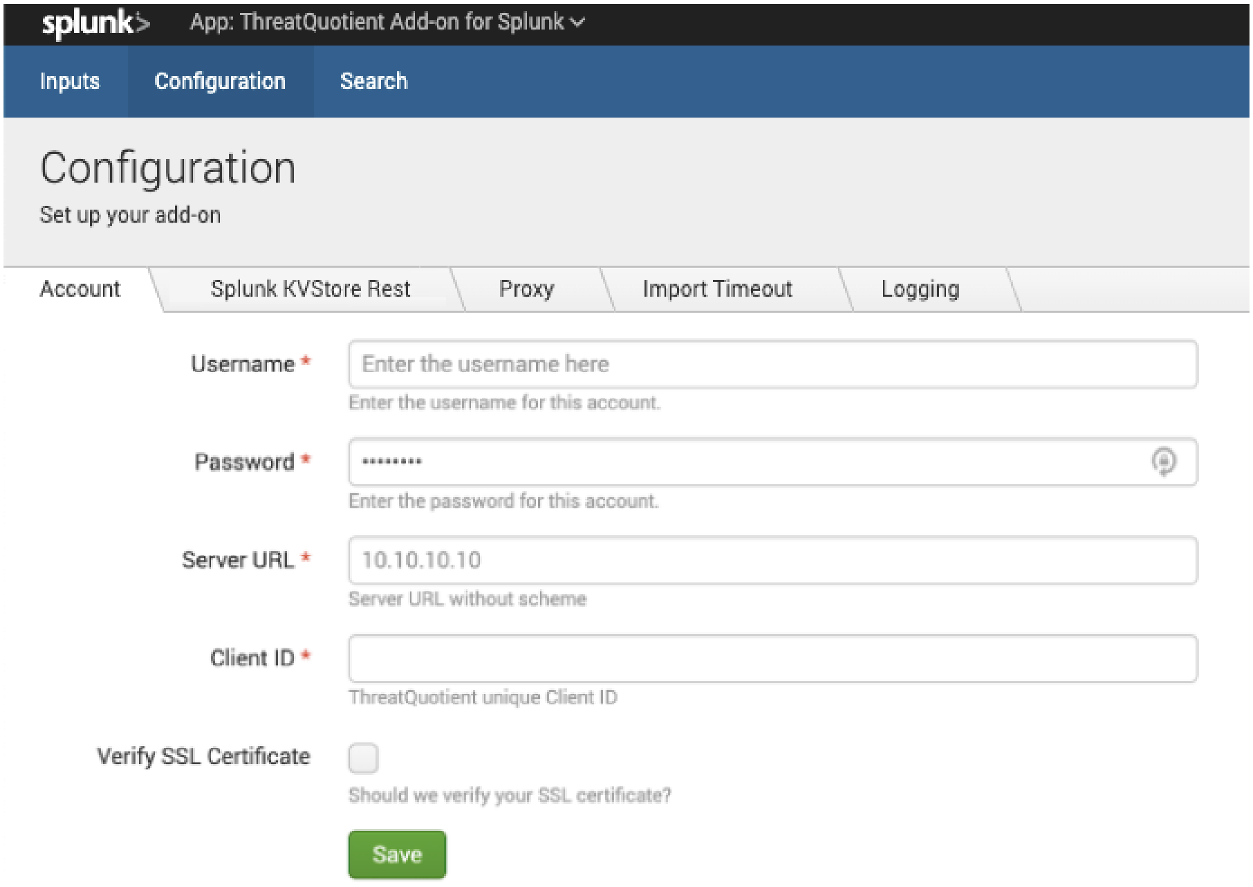
# Configuration

## ThreatQuotient Add-on

The **ThreatQuotient add-on** is responsible for authenticating with the ThreatQ platform.

### Authentication with ThreatQ

On the Configuration tab, fields are presented to configure the ThreatQ account authentication as shown below.



Configuration

Set up your add-on

Username * Enter the username here

Enter the username for this account.

Password * ••••••••

Enter the password for this account.

Server URL * 10.10.10.10

Server URL without scheme

Client ID *

ThreatQuotient unique Client ID

Verify SSL Certificate □

Should we verify your SSL certificate?

Upon clicking the **Save** button, you can see the status of the Authentication action. If the ThreatQuotient appliance is down, and/or the authentication parameters are invalid, an error message will be displayed. Unless the appliance is up and the authentication parameters are valid, this App will not work.

## Authentication with the Use of Self Signed Certificates in ThreatQ

It is common for many ThreatQuotient users to leverage self signed certificates. If this is the case, you must perform the following additional configuration steps in the Splunk Add-On App.

In `${SPLUNK_HOME}/etc/apps/TA-threatquotient-add-on/default/ta_threatquotient_add_ on_settings.conf`, make the following configuration change:

**Splunk Search for Listing TQ Indicators**

```
[additional_parameters]
verify_cert = false
```

## Splunk KVStore Rest

The App Key Value Store, commonly referred to as the **Splunk KVStore**, is a Splunk Enterprise feature that allows you to save/retrieve data within Splunk apps.

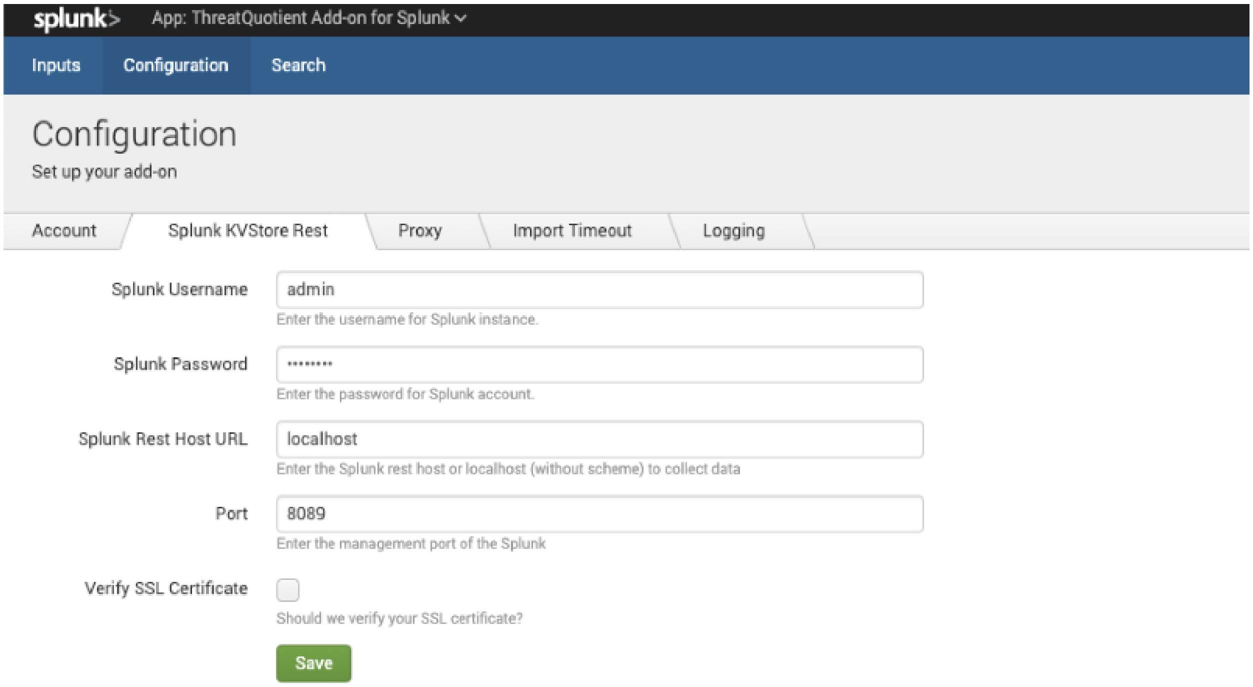
You can read more about the KVStore Splunk feature in Splunk's Developer documentation:

https://dev.splunk.com/enterprise/docs/developapps/manageknowledge/kvstore/

The Splunk KVStore Rest configuration should be updated for distributed setups to ensure data is saved into the KVStore.

Click on the **Splunk KV Store Rest** tab and complete the following fields:

| Field | Description |
|---|---|
| Splunk Username | Your username for your Splunk instance. |
| Splunk Password | The password for your Splunk user account. |
| Splunk Rest Host URL | The Splunk rest host or localhost (without scheme) to collect data.<br>***Note:*** *This is the Splunk Management Host, commonly the Search Head or Cluster member.* |
| Port | The Management port for Splunk. |
| Verify SSL Certificate | Checkbox – verify SSL Certificate. |



Configuration

Set up your add-on

Splunk Username: admin
Enter the username for Splunk instance.

Splunk Password: ••••••••
Enter the password for Splunk account.

Splunk Rest Host URL: localhost
Enter the Splunk rest host or localhost (without scheme) to collect data

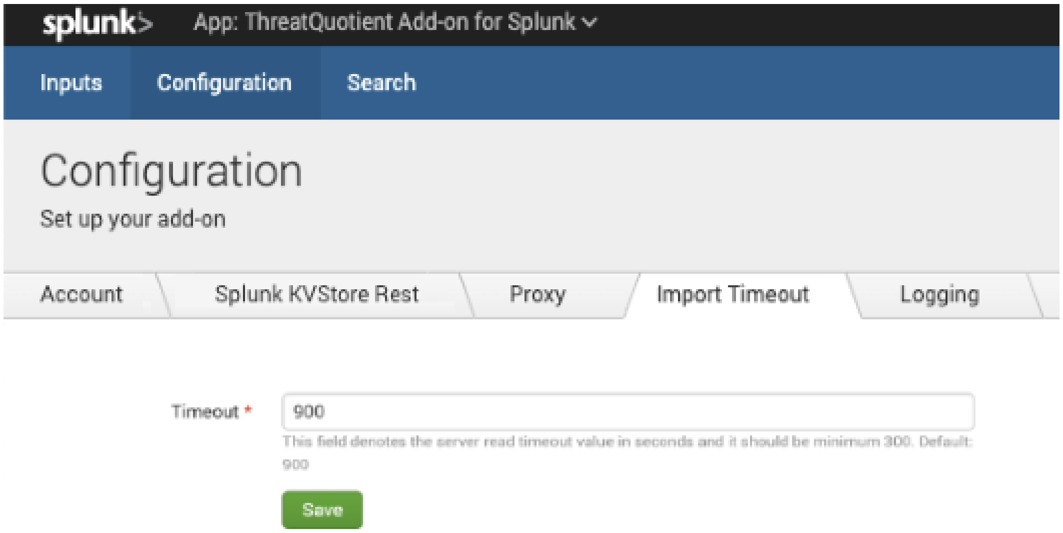
Port: 8089
Enter the management port of the Splunk

Verify SSL Certificate: □
Should we verify your SSL certificate?

## Import Timeout

Click on the Import Timeout tab to set server read timeout value in seconds.

***Note:*** *The default value is 900 seconds. The minimum value allowed is 300 seconds.*

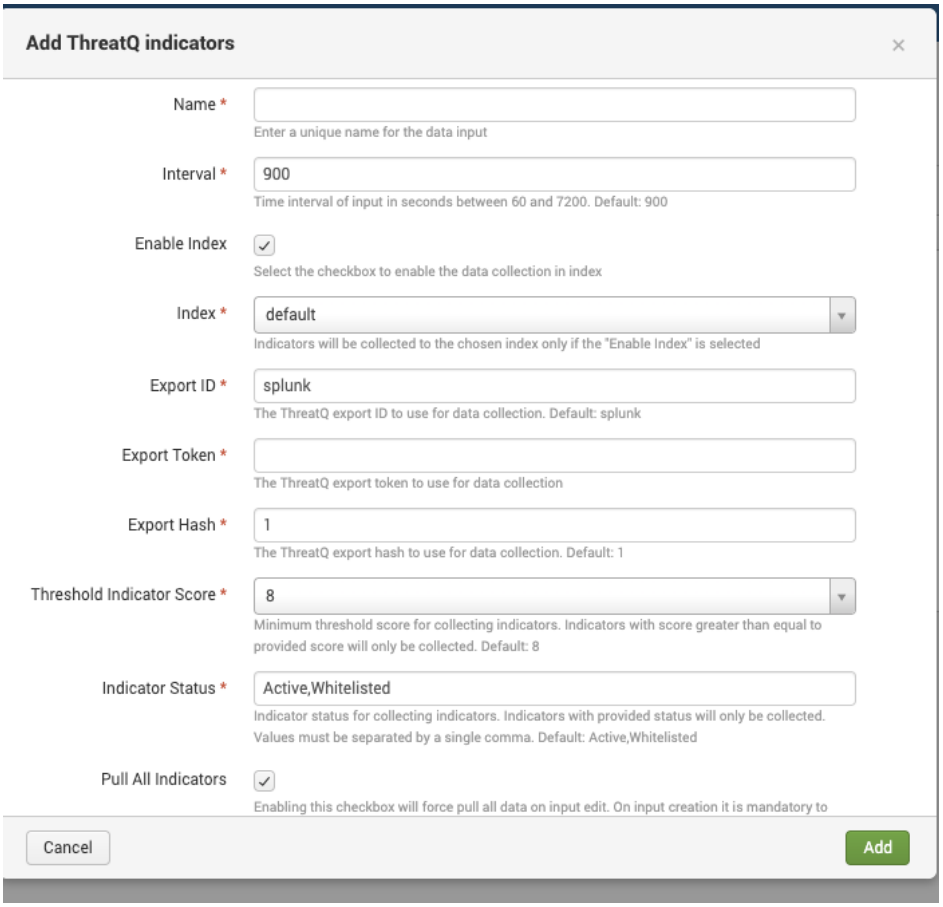


Timeout * 900

This field denotes the server read timeout value in seconds and it should be minimum 300. Default: 900

## Data Extraction from ThreatQ

On the **Inputs** tab, you can click **Create New Input** to add a data collection job as shown below.



Add ThreatQ indicators

Name *

Enter a unique name for the data input

Interval * 900

Time interval of input in seconds between 60 and 7200. Default: 900

Enable Index ☑

Select the checkbox to enable the data collection in index

Index * default

Indicators will be collected to the chosen index only if the "Enable Index" is selected

Export ID * splunk

The ThreatQ export ID to use for data collection. Default: splunk

Export Token *

The ThreatQ export token to use for data collection

Export Hash * 1

The ThreatQ export hash to use for data collection. Default: 1

Threshold Indicator Score * 8

Minimum threshold score for collecting indicators. Indicators with score greater than equal to provided score will only be collected. Default: 8

Indicator Status * Active,Whitelisted

Indicator status for collecting indicators. Indicators with provided status will only be collected. Values must be separated by a single comma. Default: Active,Whitelisted

Pull All Indicators ☑

Enabling this checkbox will force pull all data on input edit. On input creation it is mandatory to

ThreatQ instances starting with versions **4.16.0** are shipped with an **Export** that this App uses. Upon the first execution of this job, it results in the export of all indicators. Every subsequent run of this job only results in getting new indicators as well as previously exported indicators that have since changed. Various configuration parameters are described below.

***Important Note:*** *With ThreatQ Splunk App version 2.1.0 release,* `threatq_score_filter` *and* `threatq_status_filter` *macro configurations are no longer available. The thresholds for score and status can be configured on the input and those values will determine what data gets added to the ThreatQ app for Splunk and the index (if enabled).*

| Parameter | Description |
|---|---|
| Interval | The frequency of this job. For a faster detection and response, this value can be reduced. Minimum allowed is 60 seconds. |
| Enable Index (optional) | Enabling this option will result in data being saved to the designated index. Unchecking this option will result in data being saved directly to the KVStore.<br>Note: This option is enabled by default as previous app versions required ThreatQ data to be saved to the index. You must first complete the Splunk KVStore Rest configuration tab before disabling index storage. See the Authentication with the Use of Self Signed Certificates in ThreatQ chapter for more details. |
| Threshold Indicator Score | Any indicator below this score is not indexed in Splunk. This threshold is very useful to reduce the data being indexed in the **ThreatQuotient App**. Default: 8. See the important note at the beginning of this section regarding changes to score and status thresholds with ThreatQ Splunk App version 2.1.0. |
| Pull All Indicators | Enabling this checkbox will force pull all data on input edit.<br>***Note:*** *The checkbox must be selected, upon input creation, before saving. This option should be utilized when changing the status or score of any input.* |
| Indicator Status | Similar to the score threshold, any indicator not matching the status configured here is not indexed in Splunk. Again, this technique is useful for reducing indexed data. Default: **Active**, **Whitelisted.**<br>See the important note at the beginning of this section regarding changes to score and status thresholds with ThreatQ Splunk App version 2.1.0. |
| Export ID | Defaults to splunk. Use this value when using the default splunk export in ThreatQ (Splunk Indicators Export). If you make a copy of the export, you must configure the ID of the export in this field as seen on the ThreatQ instance. |

| | |
|---|---|
| Export Token | On the ThreatQ instance, find the export named as **Splunk Indicators Export** and click **Connection Settings**. The token is available in the following configuration screen. See the picture below for reference. |
| Export Hash | Defaults to **1**. In the event you want to re-export all indicators from ThreatQ for any reason (such as installing a new Splunk instance), use this con- figuration. You can configure a different alphanumeric value of length up to 32 and cause exporting all indicators from ThreatQuotient again. |

## Pagination Support

Initial import of ThreatQ data will now be performed using the pagination feature which imports a maximum of 10,000 records at once. After the initial import is complete, the import will revert to the differential method of pulling data. This will be the default behavior whenever a new input is created.

The following commands can be used to view, add or update the pagination setting on the inputs:

***Note:*** *The following actions can be performed through the app UI via the Pull All Indicators option – see the Pull All Indicators option in the Data Extraction from ThreatQ section. The commands below are CLI alternatives to the UI option.*

| Action | Command |
|---|---|
| View the pagination setting for each input | `curl -k -u username:password https://localhost:8089/servicesNS/n obody/TA-threatquotient-add- on/storage/collections/data/TA_threatquotient_add_on_checkpointer` |
| Update the pagination setting for an input | `curl -k -u username:password https://localhost:8089/servicesNS/n obody/TA-threatquotient-add- on/storage/collections/data/TA_threatquotient_add_on_checkpointer/ {input_name} -H 'Content-Type: application/json' -d '{"state" : " {\"pull_all_iocs\": true\|false}"}'` |
| Add a pagination setting for an input | `curl -k -u user:password https://localhost:8089/servicesNS/n obody/TA-threatquotient-add- on/storage/collections/data/TA_threatquotient_add_on_checkpointer -H 'Content-Type: application/json' -d '{"_key": "<input_name>", "state" : "{\"pull_all_iocs\": <true\|false>}"}'` |

| | |
|---|---|
| Delete the pagination setting for an input | `curl -k -u username:password -X  DELETE https://localhost:8089/servicesNS/n obody/TA-threatquotient-add-on/storage/collections/data/TA_ threatquotient_add_on_checkpointer/{input_name}` |

***Note:*** *Whenever a new input is created, the pagination setting (`pull_ all_iocs`) will default to true and will be automatically set to false after the initial import is completed.*

## Limitations

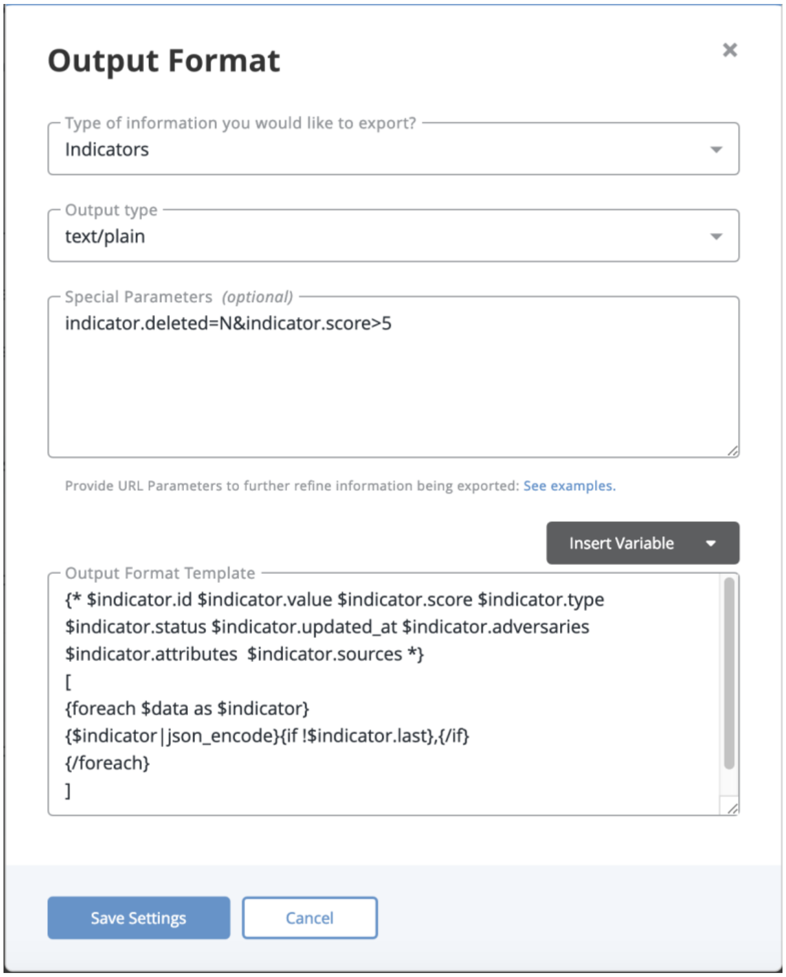
- Reducing the set of indicators in Splunk comes at the expense of inability to detect change of scores and/or statuses in indicators. We recommend that users use the "Whitelisted" status in ThreatQ to mark indicators as false positives rather than reducing the indicator score or using custom statuses.
  - It is possible to configure custom indicator statuses (other than Active and Whitelisted) and use those statuses in the workflow for interaction with the **ThreatQuotient Add-on**.
- If you want to use advanced filters (such as adversaries, attributes or sources) to export only a subset of indicators from ThreatQuotient to Splunk, there are two ways to do it:
  - Duplicate the default export and configure advanced filters. On the Splunk Add-On App, configure scoring filter in such a way that all indicators are accepted (i.e. value of 0).
  - Configure a scoring policy to influence indicator scores on certain adversaries, sources or attributes only. On the Splunk Add-On App, configure the scoring filter to accept only certain scores (i.e. value >= 8 for example).

## Exporting a Large Number of Indicators from ThreatQ

It is not recommended that you export an exceptionally large number of indicators from ThreatQ to Splunk. We recommend that at any one time, users export no more than 500K indicators. If this limit is not observed, you may encounter problems including loading the data to Splunk, and assuming the data was loaded correctly anyway, with the performance of your Splunk deployment itself.

***Note:*** *If there is a need to re-import the data from ThreatQ, revert the pagination setting for the input to True. This will ensure that the data is imported in batches of 10,000 records at a time.*

The default export shipped with the ThreatQ appliance does not apply any filters on the indicators to restrict the set of data being exported. However, you may make a copy of this export and specify any additional filters under Special Parameters. An example is shown in the picture below in which a user has configured a filter with score > 5.



Output Format

Type of information you would like to export?
Indicators

Output type
text/plain

Special Parameters *(optional)*
indicator.deleted=N&indicator.score>5

Provide URL Parameters to further refine information being exported: See examples.

Output Format Template

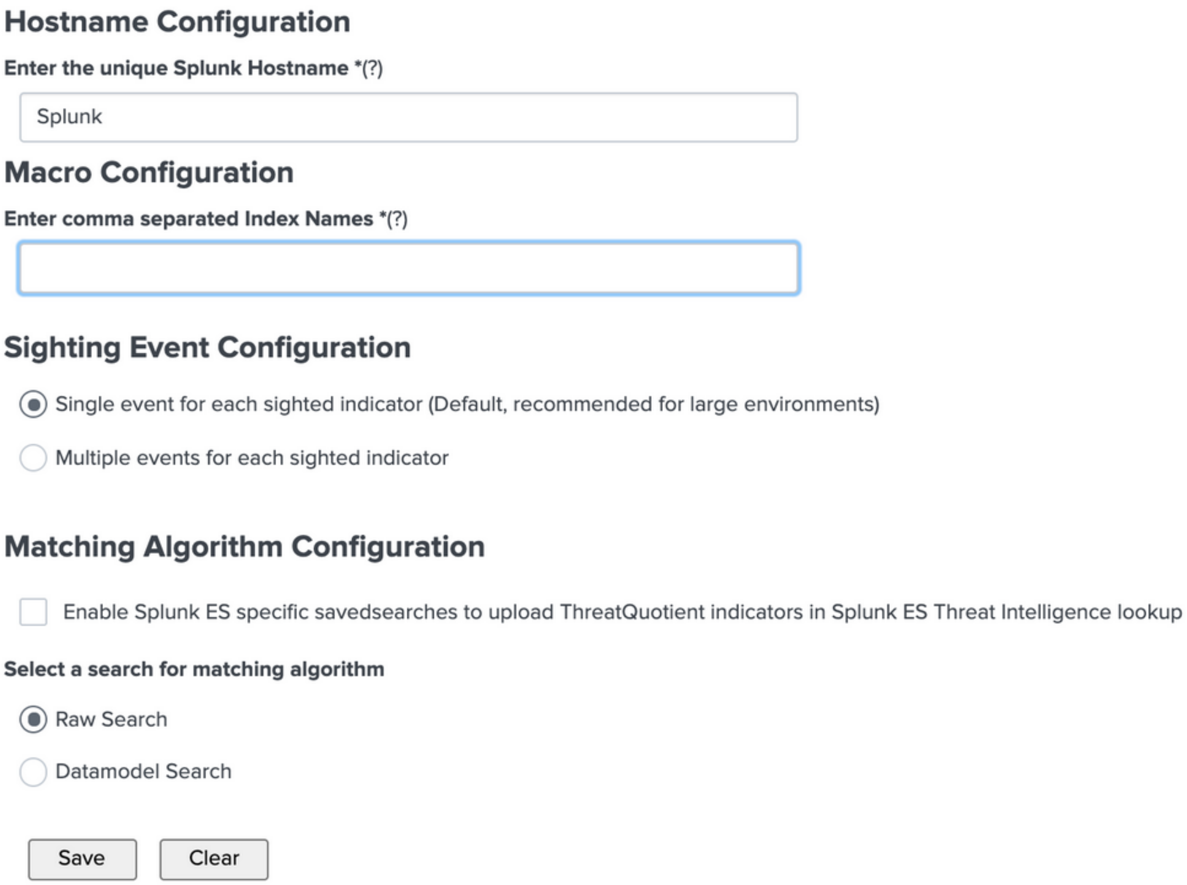
```
{* $indicator.id $indicator.value $indicator.score $indicator.type
$indicator.status $indicator.updated_at $indicator.adversaries
$indicator.attributes  $indicator.sources *}
[
{foreach $data as $indicator}
{$indicator|json_encode}{if !$indicator.last},{/if}
{/foreach}
]
```

## Data Loading in Splunk

As shown in image above, the Index parameter allows you to map the data extracted from a job in a predetermined Splunk index. You can create multiple jobs and map them to different Splunk indexes as desired.

# ThreatQuotient App

The ThreatQuotient App allows you to select one the three modes of operation described in App Usage. The configuration is available on the Splunk's **setup** page. Navigate to all Apps, locate the **ThreatQuotient App for Splunk** and click on **setup**. The image below displays an example configuration.



**Hostname Configuration**

Enter the unique Splunk Hostname *(?)

Splunk

**Macro Configuration**

Enter comma separated Index Names *(?)

**Sighting Event Configuration**

● Single event for each sighted indicator (Default, recommended for large environments)

○ Multiple events for each sighted indicator

**Matching Algorithm Configuration**

□ Enable Splunk ES specific savedsearches to upload ThreatQuotient indicators in Splunk ES Threat Intelligence lookup

Select a search for matching algorithm

● Raw Search

○ Datamodel Search

The following rules apply for selection:

| Parameter | Description |
|---|---|
| Hostname Configuration | The Hostname will be used as a Source Name when Splunk updates attributes on the ThreatQ platform. |
| Macro Configuration | ThreatQ indicators will be matched against the events from the selected indexes. |
| Sighting Event Configuration | Configuration option for event creation in ThreatQ for sighted indicators. |
| **Matching Algorithm Configuration** | |
| Splunk ES Specific Saved Searches | You can select **Enable Splunk ES** in conjunction with either **Raw Search** or **Datamodel Search**. |
| Search for Matching Algorithm | At the initial setup, you do not have to select either Raw Search or Datamodel Search modes. This disables the matching algorithm completely and gives you the opportunity to determine the right scale of data your installation can handle. See Performance.<br>You can select either **Raw Search** or **Datamodel Search** if you do make a selection, but not both.<br>***Note:*** *You can select only up to five data models in the Datamodel Search mode.* |

# Sightings and Feedback to ThreatQ

One of the primary features of this solution is to identify sightings and report them back to ThreatQ.

Sighting in this context is defined as evidence that a **ThreatQ Indicator** was discovered in one or more of the events in Splunk collected via other sources. Recording these sightings and reporting them back to ThreatQ provides analysts with important context around indicators included in their threat intelligence holdings.

This section describes various user configurations (in form of macros and saved searches) available to the user to achieve this and concludes with a summary diagram that describes the whole process.

## Separation of Data

ThreatQ indicator data is separated from the rest of the data in this App using a specific **sourcetype**. You can use the following Splunk search query to discover all indicators exported from ThreatQuotient.

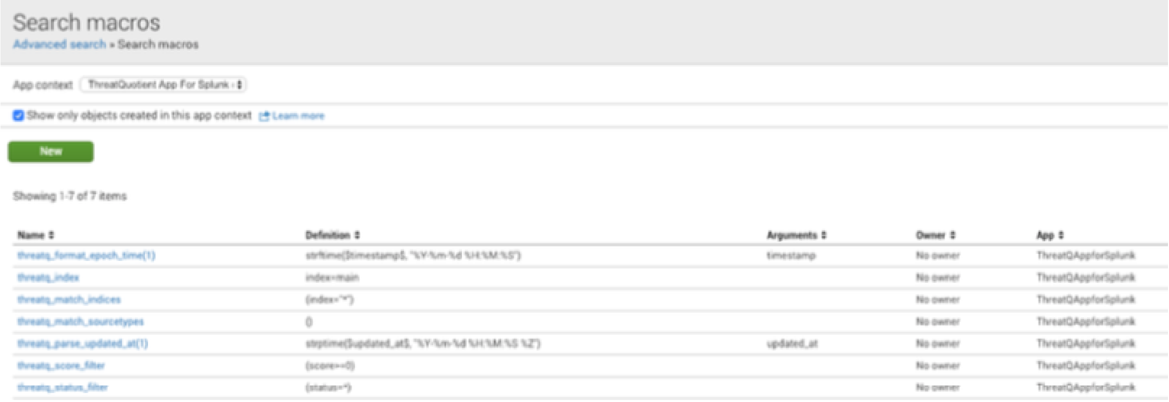
Splunk Search for Listing TQ Indicators

```
sourcetype=”threatq:indicators”
```

***Note:*** *The same indicator can be exported multiple times if it experienced a change of status and/or score.*

## Macros

The following macros are used in most of the saved searches this App is configured with (available under **Settings > Advanced Search > Search Macros**).



Search macros

Advanced search » Search macros

App context: ThreatQuotient App For Splunk

☑ Show only objects created in this app context

Showing 1-7 of 7 items

| Name ⇕ | Definition ⇕ | Arguments ⇕ | Owner ⇕ | App ⇕ |
|---|---|---|---|---|
| threatq_format_epoch_time(1) | strftime($timestamp$, "%Y-%m-%d %H:%M:%S") | timestamp | No owner | ThreatQAppforSplunk |
| threatq_index | index=main | | No owner | ThreatQAppforSplunk |
| threatq_match_indices | (index="*") | | No owner | ThreatQAppforSplunk |
| threatq_match_sourcetypes | () | | No owner | ThreatQAppforSplunk |
| threatq_parse_updated_at(1) | strptime($updated_at$, "%Y-%m-%d %H:%M:%S %Z") | updated_at | No owner | ThreatQAppforSplunk |
| threatq_score_filter | (score>=0) | | No owner | ThreatQAppforSplunk |
| threatq_status_filter | (status=*) | | No owner | ThreatQAppforSplunk |

The description of some of these search macros is below.

***Important Note:*** *With ThreatQ Splunk App version 2.1.0 release,* `threatq_score_filter` *and* `threatq_status_filter` *macro configurations are no longer available. The thresholds for score and status can be configured on the input and those values will determine what data gets added to ThreatQ app for Splunk and the index (if enabled).*

| Saved Search Macro | Description |
|---|---|
| `threatq_index` | Configures the name of the Splunk index that all ThreatQ indicators are mapped to. |
| `threatq_match_indices` | Configures which Splunk indices are considered for matching. The users can apply more specific filters here. |
| `threatq_match_sourcetypes` | Configures which sourcetypes should be **excluded** from matching (the sourcetype **threatq:indicators** is automatically excluded). |
| `threatq_match_process_count` | Determines the number of cpu cores utilized for processing the saved searches that are responsible for finding evidence of sightings. |
| `enable_url_partial_match_datamodel` | Configures partial URL indicator matching for the **Datamodel** . The default setting is **False**.<br>This macro should be set to **True** if URL indicators are sent to Splunk with a scheme. **Example:** http://, https:// |

# Saved Searches

The Splunk App uses saved searches for discovering sightings and reporting them back to ThreatQ. The App is preconfigured with saved searches, which are periodic processes (registered to the crontab) designed to map indicators to specific Splunk indices and match these indicators to events. Saved search processes also move older indicators out of the main lookup tables and for ES customers, move indicators to specific ES lookup tables according to the mapping described in this document.

The table below describes some of the saved searches with which this App is preconfigured. This table displays two searches applicable only for Raw Matching Mode. Equivalent searches are available for each data model in the Datamodel Matching Mode.

***Note:*** *ThreatQuotient does not recommend setting the frequency to less than 30 minutes, the application default for threatq_match_ indicator saved searches, if using the configuration option for creating multiple events for each sighted indicator.*

| Saved Search | Description | Default Period |
|---|---|---|
| `threatq_consume_indicators_new` | Post matched indicators to the consume endpoint of ThreatQ and create atomic events. This search will only be enabled if using the "Create multiple events for each sighted indicator" configuration. | 30 minutes |
| `threatq_match_indicators (Raw Matching Mode only)` | Finds evidence of sightings for all indicators in the **master lookup table**. If sightings are detected, indicators are moved to the **match lookup table**. | 30 minutes |
| `threatq_match_indicators` | Finds evidence of sightings for all indicators in the **match lookup table**. | 30 minutes |

| Saved Search | Description | Default Period |
|---|---|---|
| `threatq_cleanup_indicators_on_indicators_change` | If indicator status changes from Active to Whitelisted (or any other status not considered for finding evidence of sightings), or if the indicator score drops below a threshold (making the indicator ineligible for finding evidence of sightings), removes those indicators from both **master lookup table** and **match lookup table**. | 15 minutes |
| `threatq_update_matched_indicators` | Finds evidence of sightings for all indicators in the **match lookup table**. | 30 minutes |
| `threatq_consume_indicators` | Creates events in ThreatQ for all newly detected sightings. | 15 minutes |
| `threatq_update_retired_indicators` | Clean up indicators that haven't been matched on in the last 90 days from both **master lookup table** and **match lookup table**. | 1,440 minutes |
| **Editability Rules:** Because of the way sightings are found in Splunk using two saved searches (**threatq_match_indicators and threatq_update_ matched_indicators**), their frequency must be the same if edited. The default frequency for both saved searches is 30 minutes. | | |

# Saved Searches Documentation

The following table documents the macros for saved searches as configured by default on the ThreatQuotient App.

<table>
<tr><th>Saved Search</th><th>Default Macro</th></tr>
<tr><td>threatq_consume_indicators_new</td><td>| inputlookup threatq_matched_indicators | eval start_time=relative_time(now(), "-35m") | where match_time &gt; start_time | sort 10000 -num(score), -num(match_count) | threatqconsumeindicatorsnew</td></tr>
<tr><td>threatq_cleanup_indicators_on_indicators_ change</td><td>| inputlookup master_lookup | search NOT [search `threatq_index` sourcetype="threatq:indicators" | dedup value |<br>search [| inputlookup master_lookup | table ioc_value | rename ioc_value as value |<br>format] NOT (`threatq_score_filter` `threatq_status_filter`) | table value | rename value as ioc_value |<br>format] | outputlookup master_lookup | join ioc_value [| inputlookup threatq_matched_indicators |<br>table ioc_value, match_time, first_seen, last_seen, match_count, sid] | outputlookup threatq_matched_indicators</td></tr>
<tr><td>threatq_match_indicators (only Raw Matching Mode)</td><td>`threatq_match_indices` `threatq_match_sourcetypes` sourcetype!="threatq:indicators" | threatqmatchiocs</td></tr>
<tr><td>threatq_update_matched_indicators (only Raw Matching Mode)</td><td>`threatq_match_indices` `threatq_match_sourcetypes` sourcetype!="threatq:indicators" | threatqmatchiocs is_update=true</td></tr>
</table>

| | |
|---|---|
| threatq_consume_indicators | \| inputlookup threatq_matched_indicators \| eval start_time=relative_time(now(), "-16m") \| where last_seen &gt; start_time \| threatqconsumeindicators |
| threatq_update_retired_indicators | \| inputlookup master_lookup \| search NOT [\| inputlookup master_lookup \| search NOT [\| inputlookup threatq_matched_indicators \| search NOT [\| inputlookup threatq_matched_indicators \| eval threshold_time=now()-7776000, value=ioc_value \| where last_seen &lt; threshold_time \| outputlookup key_field=value threatq_retired_matched_indicators \| table ioc_value \| format] \| outputlookup threatq_matched_indicators \| table ioc_value \| format] \| eval threshold_time=now()-7776000, updated_at_epoch=`threatq_parse_updated_at(updated_at)`, value=ioc_value \| where updated_at_epoch &lt; threshold_time \| outputlookup key_field=value threatq_retired_indicators \| table ioc_value \| format] \| outputlookup master_lookup |

As described above, two of the saved searches are applicable only for the Raw Matching Mode. If you select **Datamodel Matching Mode** from the configuration as described in the Configuration section, the above two saved searches for **Raw Matching Mode** will disable automatically, and the equivalent saved searches for the **Datamodel Matching Mode** will be enabled.

# Reporting Sightings in ThreatQ

A sighting in Splunk is evidence that an indicator from ThreatQ was seen in one or more events in Splunk. This is important information for an analyst that can be reported back in form of an Event.

## Single Event for Each Sighted Indicator

ThreatQ captures all sightings for an indicator in a single event. When more sightings are detected for the same indicator, certain attributes for that event are updated. This allows the analyst to gather context on sightings for that indicator.

## Multiple Events for Each Sighted Indicator

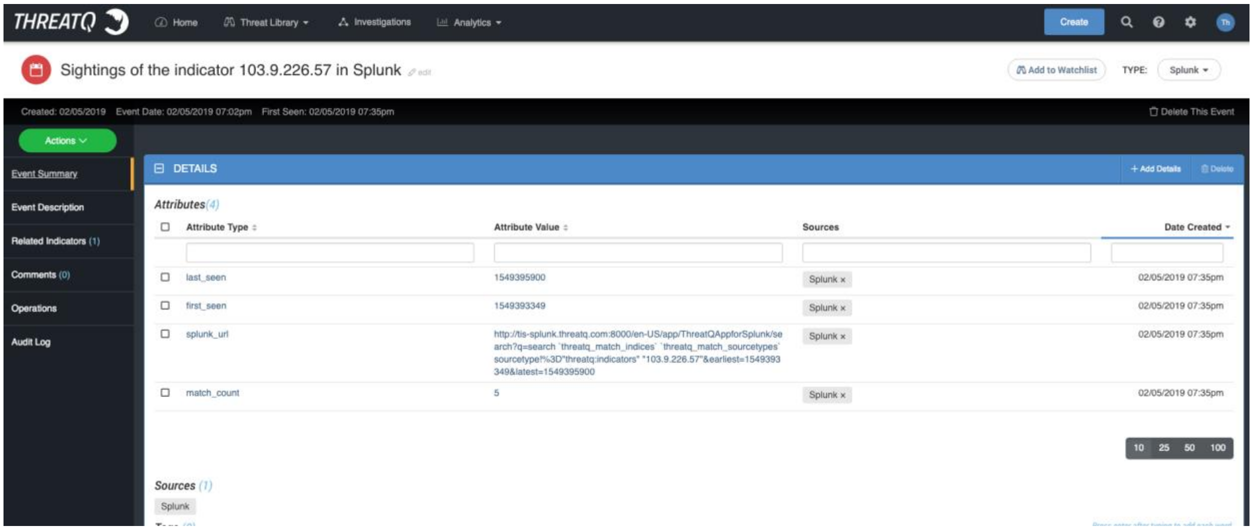
If multiple sightings for the event are seen during the same time period, all sightings will be captured in a single event. However, if more sightings are seen in the future for the same indicator, a new event will be created in ThreatQ.

See the *Sighting Event Configuration* instructions under the ThreatQuotient App section for more details.

The following 4 attributes are recorded for the event.

| Attribute | Description |
|---|---|
| First Seen | Timestamp when the first sighting for this indicator was recorded in Splunk. This attribute does not change. |
| Last Seen | Timestamp when the latest sighting for this indicator is recoded in Splunk. This attribute updates as newer sightings are detected. |
| Count | The total count of all sightings recorded for this indicator starting from the time **First Seen** until **Last Seen**. |
| Splunk URL | The URL that allows the analyst to view all sightings for this indicator in Splunk starting from **First Seen** until **Last Seen**. |

The screen capture below shows an example event recorded in ThreatQuotient by the Splunk App.



Sightings of the indicator 103.9.226.57 in Splunk

Created: 02/05/2019 Event Date: 02/05/2019 07:02pm First Seen: 02/05/2019 07:35pm

Attributes (4)

| Attribute Type | Attribute Value | Sources | Date Created |
|---|---|---|---|
| last_seen | 1549395900 | Splunk × | 02/05/2019 07:35pm |
| first_seen | 1549393349 | Splunk × | 02/05/2019 07:35pm |
| splunk_url | http://tis-splunk.threatq.com:8000/en-US/app/ThreatQAppforSplunk/search?q=search `threatq_match_indices` `threatq_match_sourcetypes` sourcetype!%3D"threatq:indicators" "103.9.226.57"&earliest=1549393349&latest=1549395900 | Splunk × | 02/05/2019 07:35pm |
| match_count | 5 | Splunk × | 02/05/2019 07:35pm |

Sources (1)

Splunk

The following contextual data are added to the indicator :

| Attribute | Description |
|---|---|
| Splunk Sighting Timestamp | When the latest sighting for this indicator was recorded in Splunk. |
| Match Count | The total count of all sightings recorded for this indicator. |
| Source | **Splunk** will be added as the **Source** for this indicator. |

# Putting Everything Together

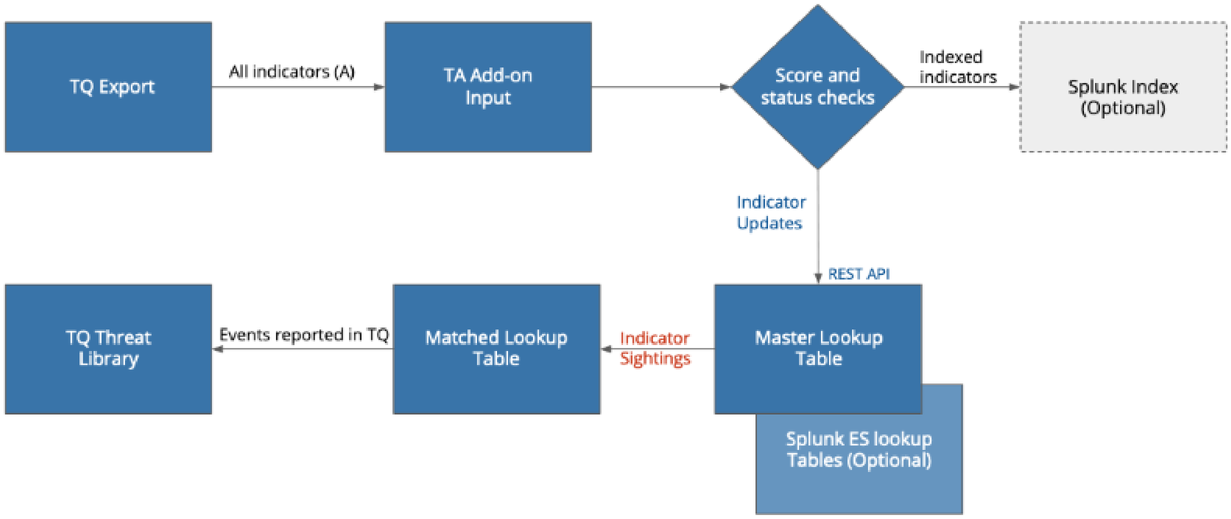
The following steps summarize how indicators are stored in Splunk and how sightings are reported back to ThreatQ.

1. The Input job configured on **ThreatQuotient Add-on** (on the heavy forwarder) pulls indicators from ThreatQ.
2. The heavy forwarder sends the indicators to the indexer which indexes the indicators to the **default** index (user can override) or KVStore.

   **Note:** You can configure how data is saved, to the designed index or KVStore, via the Enable Index checkbox on the Add ThreatQ Indicators form. See the *Data Extraction from ThreatQ* section of this guide for more details.
3. The periodic saved search job **threatq_match_indicators** finds evidence of sightings of all indicators in the **master lookup table** against all events in Splunk (as filtered via various configurable macros described above in this section).

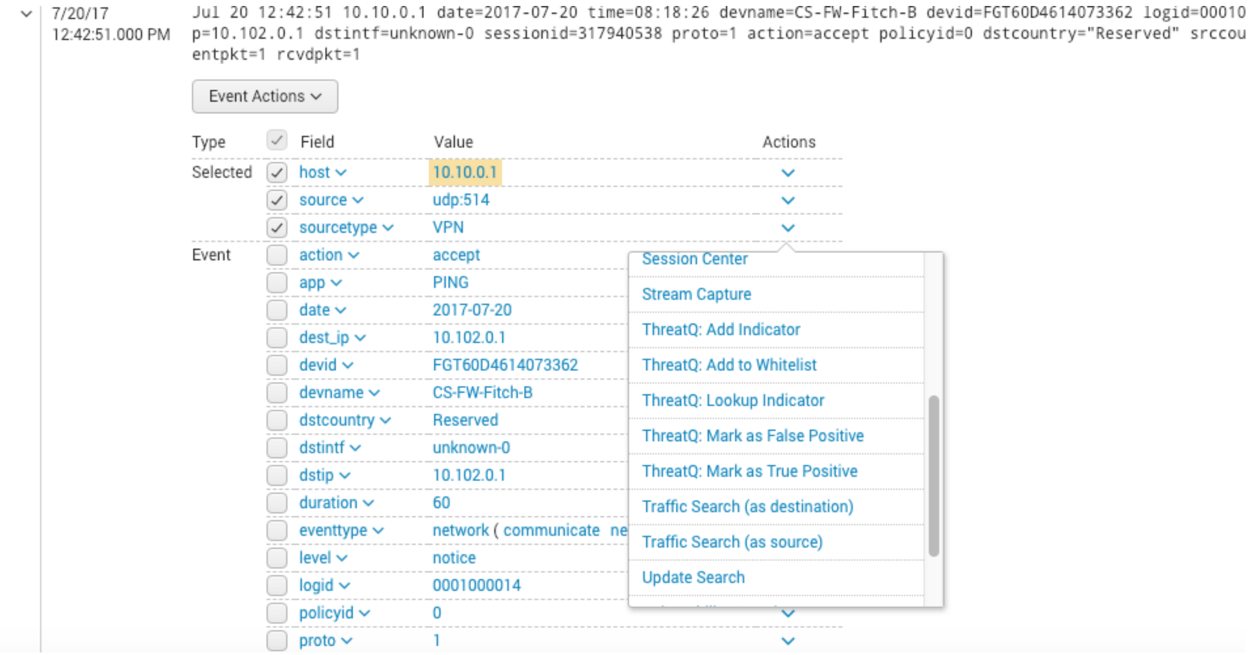
   a) If evidence of sightings is found for a specific indicator, it is moved to the **match lookup table**.
4. Simultaneously, another periodic saved search job **threatq_update_matched_indicators** finds more sightings for all indicators from the match lookup table against all events in Splunk (as filtered by the same configurable macros).
5. A periodic saved search **threatq_consume_indicators** will create events in ThreatQ to represent evidence of sightings in Splunk.
6. The periodic saved search job **threatq_update_retired_indicators** takes all indicators that are not updated in the past 90 days out of both the master lookup table and matched lookup table.

The following diagram summarizes this process.


TQ Export
All indicators (A)
TA Add-on Input
Score and status checks
Indexed indicators
Splunk Index (Optional)
Indicator Updates
REST API
Master Lookup Table
Splunk ES lookup Tables (Optional)
Indicator Sightings
Matched Lookup Table
Events reported in TQ
TQ Threat Library

# Workflow Actions

The **ThreatQuotient Add-on** provides five user workflow actions to the analysts for providing interactivity with the ThreatQuotient platform from Splunk. As shown on the diagram below, the actions can be invoked on any Splunk event by expanding the event view and clicking on the down arrow in the column below **Action**.



7/20/17
12:42:51.000 PM

```
Jul 20 12:42:51 10.10.0.1 date=2017-07-20 time=08:18:26 devname=CS-FW-Fitch-B devid=FGT60D4614073362 logid=00010
p=10.102.0.1 dstintf=unknown-0 sessionid=317940538 proto=1 action=accept policyid=0 dstcountry="Reserved" srccou
entpkt=1 rcvdpkt=1
```

| Type | ☑ | Field | Value | Actions |
|---|---|---|---|---|
| Selected | ☑ | host | 10.10.0.1 | |
| | ☑ | source | udp:514 | |
| | ☑ | sourcetype | VPN | |
| Event | □ | action | accept | |
| | □ | app | PING | |
| | □ | date | 2017-07-20 | |
| | □ | dest_ip | 10.102.0.1 | |
| | □ | devid | FGT60D4614073362 | |
| | □ | devname | CS-FW-Fitch-B | |
| | □ | dstcountry | Reserved | |
| | □ | dstintf | unknown-0 | |
| | □ | dstip | 10.102.0.1 | |
| | □ | duration | 60 | |
| | □ | eventtype | network ( communicate ne | |
| | □ | level | notice | |
| | □ | logid | 0001000014 | |
| | □ | policyid | 0 | |
| | □ | proto | 1 | |

Event Actions
Session Center
Stream Capture
ThreatQ: Add Indicator
ThreatQ: Add to Whitelist
ThreatQ: Lookup Indicator
ThreatQ: Mark as False Positive
ThreatQ: Mark as True Positive
Traffic Search (as destination)
Traffic Search (as source)
Update Search

The actions are described below.

| Action | Description |
|---|---|
| ThreatQ: Add Indicator | This workflow action adds the indicator to ThreatQ. You are presented with UI inputs that allow you to select indicator type, status and source. If the data and type do not match, an error is reported. Successful completion of this workflow action results in the indicator being successfully added to the ThreatQ Threat Library. |
| ThreatQ: Add to Whitelist | This workflow action sets the status of the indicator to Whitelisted in ThreatQ. If the indicator does not exist in ThreatQ, an error is reported. |
| ThreatQ: Lookup Indicator | This workflow action searches for an indicator in ThreatQ and pulls additional context for that |

| Action | Description |
|---|---|
| | indicator. If the indicator does not exist in ThreatQ, an error is reported. |
| ThreatQ: Mark as False Positive | This workflow action adds the attribute key-value "**False Positive: True**" to the indicator in<br>ThreatQ. If the indicator does not exist in ThreatQ, an error is reported. |
| ThreatQ: Mark as True Positive | This workflow action adds the attribute key-value "**True Positive: True**" to the indicator in ThreatQ. If the indicator does not exist in ThreatQ, an error is reported. |

# CIM Support

The App runs in the Datamodel Search mode when you are taking advantage of Splunk's CIM and mapping your logs and events to various data models provided by Splunk. The following table summarizes how the matching algorithm will match specific data model fields to specific indicator types in ThreatQuotient.

**ThreatQ indicator type to CIM field map for the matching algorithm**

| CIM Data Models | Data Model Fields | ThreatQ Indicator Types Matched |
|---|---|---|
| Authentication | Authentication.src_user | Username |
| | Authentication.user | Username |
| Certificates | Certificates.All_Certificates.SSL.ssl_hash | SHA-1, SHA-256, SHA-384, SHA-512 |
| | Certificates.All_Certificates.SSL.ssl_issuer_email | Email Address |
| | Certificates.All_Certificates.SSL.ssl_subject_ email | Email Address |
| | Certificates.All_Certificates.SSL.ssl_subject_ common_name | String |
| | Certificates.All_Certificates.SSL.ssl_issuer_common_name | String |
| | Certificates.All_Certificates.SSL.ssl_subject_ organization | String |

| CIM Data Models | Data Model Fields | ThreatQ Indicator Types Matched |
|---|---|---|
| | Certificates.All_Certificates.SSL.ssl_issuer_ organization | String |
| | Certificates.All_Certificates.SSL.ssl_serial | String |
| | Certificates.All_Certificates.SSL.ssl_subject_ unit | String |
| | Certificates.All_Certificates.SSL.ssl_issuer_unit | String |
| Endpoint | Endpoint.Services.service | Service Name |
| | Endpoint.Processes.process_name | Service Name |
| | Endpoint.Filesystem.file_name | Filename |
| | Endpoint.Filesystem.file_hash | SHA-1, SHA-256, SHA-384, SHA-512 |
| Email | Email.All_Email.file_name | Filename |
| | Email.All_Email.file_hash | SHA-1, SHA-256, SHA-384, SHA-512 |
| | Email.All_Email.subject | Email Subject |
| | Email.All_Email.src_user | Email Address |
| Intrusion_Detection | Intrusion_Detection.IDS_Attacks.src | IP Address, IPv6 Address |

| CIM Data Models | Data Model Fields | ThreatQ Indicator Types Matched |
|---|---|---|
| | Intrusion_Detection.IDS_Attacks.signature | String |
| | Intrusion_Detection.IDS_Attacks.user | Username |
| Inventory | All_Inventory.User.user | Username |
| Malware | Malware.Malware_Attacks.file_name | Filename |
| | Malware.Malware_Attacks.file_hash | SHA-1, SHA-256, SHA-384, SHA-512 |
| | Malware.Malware_Attacks.signature | String |
| | Malware.Malware_Attacks.sender | Email Address |
| | Malware.Malware_Attacks.src | IP Address, IPv6 Address |
| | Malware.Malware_Attacks.user | Username |
| Network_Traffic | Network_Traffic.All_Traffic.src | IP Address, IPv6 Address |
| Network Resolution (DNS) | Network_Resolution.DNS.query | FQDN, String |
| | Network_Resolution.DNS.answer | FQDN, String |
| Updates | Updates.Updates.file_name | Filename |

| CIM Data Models | Data Model Fields | ThreatQ Indicator Types Matched |
|---|---|---|
| | Updates.Updates.file_hash | SHA-1, SHA-256, SHA-384, SHA-512 |
| Web | Web.Web.user | Username |
| | Web.Web.http_referrer | URL |
| | Web.Web.url | URL |
| | Web.Web.http_user_agent | User-agent |
| | Web.Web.src | IP Address, IPv6 Address |
| | Web.Web.dest | IP Address, IPv6 Address |
| Incident_Management | Incident_Management.Notable_Events.src | IP Address, IPv6 Address |
| | Incident_Management.Suppressed_Notable_ Events.src | IP Address, IPv6 Address |
| | Incident_Management.Notable_Event_Suppressions. Suppression_Audit.signature | String |
| | Incident_Management.Notable_Event_Suppressions. Suppression_Audit_Expired.signature | String |
| | Incident_Management.Notable_Event_Suppressions. Suppression_Audit.user | Username |

# Enterprise Security Support

## ThreatQ Indicators to Splunk Enterprise Security Lookup Tables

The App provides support to the Splunk Enterprise Security (ES) customers by making ThreatQ data more accessible using Splunk's native ES lookup tables. The following table provides how ThreatQ data is mapped to the Splunk ES lookup tables. This data is then available in various ES dashboards.

**ThreatQ indicator type mapping to Enterprise Security lookup tables**

| ThreatQ Type | Threat Intelligence Type |
|---|---|
| CIDR Block | local_ip_intel |
| Email Address | local_email_intel |
| Email Subject | local_email_intel |
| File Name | local_file_intel |
| FQDN | local_domain_intel |
| Fuzzy Hash | local_file_intel |
| GOST Hash | local_file_intel |
| IP Address | local_ip_intel |
| MD5 | local_file_intel |
| Registry Key | local_registry_intel |
| Service Name | local_service_intel |
| SHA-1 | local_file_intel |
| SHA-256 | local_file_intel |
| SHA-384 | local_file_intel |

| ThreatQ Type | Threat Intelligence Type |
|---|---|
| SHA-512 | local_file_intel |
| x509 Serial | local_certificate_intel |
| x509 Subject | local_certificate_intel |
| URL | local_http_intel |
| URL Path | local_http_intel |
| Username | local_user_intel |

To view the events and indicators, navigate to **Enterprise Security > Security Intelligence > Threat Intelligence**.

- **Threat Activity**: Shows the list of events which are compatible with CIM apps.
- **Threat Artifacts**: Shows the list of indicators fetched from the ThreatQ.

## Using Threat Intelligence Data in Splunk Enterprise Security

Splunk's Enterprise Security App provides the means of using your threat intelligence data to match against events mapped to standard Splunk models. Refer to the Splunk's documentation on **Enterprise Security Workflow for Threat Intelligence** as described here: http://dev.splunk.com/view/enterprise-security/SP-CAAAFBC.

ThreatQuotient provides mapping of the threat intelligence data to the standard lookup tables in Splunk Enterprise Security via the saved searches described above. Using the default Threat Generation Searches in the Enterprise Security, the ES app will find matches and report those matches in the `threat_activity` index as described in the link above.

Threat Intelligence data will be added to Enterprise Security using their REST APIs with a threat_key of `threatq_indicator`. The score for ThreatQ Indicators will be mapped to the **Weight** attribute in ES. Any updates to the score will be automatically reflected in ES using the periodic saved searches.

The indicator will be updated in ES and put into a disabled state (will no longer be used in further correlation) if the score or status of a ThreatQ indicator changes to a value that is no longer within the parameters configured in the macro settings for ThreatQ Splunk App.

***Important Note****: If you are using ES and are upgrading from an older version of ThreatQ Splunk App, please run the "threatq_cleanup_es_lookups" saved search once to remove the old data. All the threat intelligence data is automatically added upon upgrade using the Enterprise Security's REST APIs.*

***Note:*** *When using the Enterprise Security App, you will not have additional con- text (sources and adversaries), workflow actions ,and reporting sightings back to ThreatQuotient available to you.*

## Saved Searches for Enterprise Security

In addition to the core saved searches, the following saved searches apply for Enterprise Security (ES) customers. The saved searches listed run once a day and map ThreatQ indicators by type to Splunk ES lookup tables as described in the **Mapping Table** section of the document.

***Note:*** *By default, the* ***scheduling*** *of all saved searches for porting Threat Intelligence data from ThreatQ to lookup tables in the ES are* ***disabled****. This is because not all users have Enterprise Security App installed. If you have this App installed and want to port the Threat Intelligence data over, you will need to enable the scheduling of these saved searches.*

### Saved Searches for Mapping ThreatQ Indicator data to Splunk's CIM

| ES Saved Search | Description |
|---|---|
| threatq_update_threat_intelligence_lookup_email_address | Map ThreatQ **type 4** indicators to **local_email_intel** |
| threatq_update_threat_intelligence_lookup_email_subject | Map ThreatQ **type 6** indicators to **local_email_intel** |
| threatq_update_threat_intelligence_lookup_file_name | Map ThreatQ **type 9** indicators to **local_file_intel** |
| threatq_update_threat_intelligence_lookup_fqdn | Map ThreatQ **type 10** indicators to **local_domain_intel** |
| threatq_update_threat_intelligence_lookup_hash | Map ThreatQ **type [11,12,15,20,21,22,23]** indicators to **local_file_intel** |
| threatq_update_threat_intelligence_lookup_ip | Map ThreatQ **type 14** indicators to **local_ip_intel** |
| threatq_update_threat_intelligence_lookup_registry | Map ThreatQ **type 18** indicators to **local_registry_intel** |
| threatq_update_threat_intelligence_lookup_service | Map ThreatQ **type 19** indicators to **local_service_intel** |
| threatq_update_threat_intelligence_lookup_certificate_serial | Map ThreatQ **type 25** indicators to **local_certificate_intel** |

| ES Saved Search | Description |
|---|---|
| threatq_update_threat_intelligence_lookup_certificate_subject | Map ThreatQ **type 26** indicators to **local_certificate_intel** |
| threatq_update_threat_intelligence_lookup_url | Map ThreatQ **type 27** indicators to **local_http_intel** |
| threatq_update_threat_intelligence_lookup_user | Map ThreatQ **type 30** indicators to **local_user_intel** |

# Performance

The primary objective of this App is to find evidence of sightings and report those sightings back to ThreatQuotient. The sightings are discovered using the matching **algorithm** that works either in the **Raw Matching** or **Datamodel Matching Mode**. Broadly speaking, the matching algorithm will take the set of indicators from ThreatQuotient, a set of events from Splunk and find which indicators (and how many times) appear in the events. The matching algorithm by default runs every 30 minutes in a saved search, so it is important that it completes in under 30 minutes on average just to keep up with incoming load.

The tables below demonstrate the performance of matching algorithm for both modes. These tables are meant to be used as guidelines so you can configure your App to run for an optimal performance.

**Raw Matching Performance Table**

| Total Indicators from TQ | Total Raw Events in Splunk | Total Indicators Matched | Time to Complete (s)<br>Machine Specs☹16 Core, 32GB RAM) |
|---|---|---|---|
| 100,000 | 500,000 | 0 | 885.36 |
| 100,000 | 500,000 | 10,000 | 899.75 |
| **100,000** | **1,000,000** | **20,000** | **1,932.04** |
| **500,000** | **1,000,000** | **0** | **1,926.62** |
| **500,000** | **1,000,000** | **10,000** | **2,020.56** |
| 1,000,000 | 1,000,000 | 0 | 2,174.18 |
| 1,000,000 | 1,000,000 | 25,000 | 2,294.39 |
| 1,000,000 | 5,000,000 | 0 | 11,354.64 |
| 10,000 | 50,000,000 | 0 | 35,233.185 (9 hr 47 min) |

Experiments were conducted on a machine with 16 cores and 32 GB RAM. The parameters are total number of indicators from TQ, total events from Splunk and number of indicators matched. Events were generated from various standard templates covering a wide range of firewall and web proxy logs. The bolded rows show the upper limit of performance in that the time to complete is slightly over 30 mins. We discovered that the **upper limit** was reached at around 1 million Splunk events and was largely invariant of number of indicators from ThreatQ (due to how this algorithm is implemented). As more matches are found, it takes more time to write them in the lookup tables, thus slightly increasing the runtime.

**Datamodel Matching Performance Table**

| Total Indicators from TQ | Total Raw Events in Splunk | Total Indicators Matched | Time to Complete (s)<br>Machine Specs☹16 Core, 32GB RAM) |
|---|---|---|---|
| 100,000 | 1,000,000 | 20,000 | 77.649 |
| 500,000 | 1,000,000 | 0 | 99.473 |
| 500,000 | 1,000,000 | 10,000 | 130.991 |
| 1,000,000 | 1,000,000 | 0 | 166.517 |
| 1,000,000 | 1,000,000 | 25,000 | 261.362 |
| 1,000,000 | 5,000,000 | 0 | 420.111 |
| 100,000 | 5,000,000 | 10,000 | 619.047 |
| 1,000,000 | 10,000,000 | 10,000 | 1,316.541 |
| **1,000,000** | **15,000,000** | **10,000** | **1,866.059** |
| 1,000,000 | 50,000,000 | 25,000 | 6,554.610 |

Similar experiments were done for a Datamodel Matching case. From the table above, we determined that at around 15 million mark for Splunk events, the algorithm runtime started exceeding 30 minutes. **Thus, for a single saved search, this represents the upper limit of how much data this algorithm can handle every 30 minutes**.

We advise that you experiment on your system to ensure that your system does not have data loaded at higher rates than is implied by the above tables. If the machine specs are different, it is advisable to first simply run the match queries in the Splunk's search bar and get a sense of how long it takes a typical query to finish. Once you find the right amount of data your installation can handle, you are advised to instrument the App in a way that it will only perform matching on the said amount of data.

# Scaling the App

The tables displayed in Performance offer a guideline of how many Splunk events the App can handle with default configuration. As found from the internal testing, table 8 demonstrates the upper limit for raw search is about **1 million events/30 minutes**, and the same is **15 million events/30 minutes** for the datamodel search (on a dedicated box with 16 cores and 32 GB RAM). However, this is valid only for one saved search running on one node.

The best way to scale the App is to run **multiple saved searches for matching**. This is easy to do in datamodel search mode. If your data is mapped to multiple Spunk data models from Table 5, each data model is handled by a separate saved search. In such an instance, you would need to deploy your search head in a cluster and ensure that these saved searches are distributed in that cluster. You can run up to five of them, thus potentially scaling your App to handle 5 times the traffic.

For the raw matching mode, the App by default will only be able to run one saved search. In order to extend it to multiple searches, you will have to **break apart this one saved search into multiple**, and then, distribute these saved searches in the Splunk cluster of search heads. You can do this by running a separate saved search for:

- Splunk index for events
- ThreatQuotient indicator types.

For using a fixed Splunk index for the saved search, you can modify the default saved searches for matching as shown below.

### Splunk Search for Listing TQ Indicators

```
index=<my_index> `threatq_match_sourcetypes` source-
type!="threatq:indicators" | threatqmatchiocs indicator_types-
='IP Address, FQDN'(threatq_match_indicators saved search)
index=<my_index> `threatq_match_sourcetypes` source-
type!="threatq:indicators" | threatqmatchiocs is_update=true
(threatq_update_matched_indicators saved search)
```

Compare the above saved searches with the defaults as shown in the Save Search Documentation table. The macro **threatq_match_indices** is replaced by passing an actual index to the saved search. Now, you can make multiple copies of the default saved search, run them on the same schedule, and have each saved search get events from a different Splunk index.

To use the similar technique for ThreatQuotient indicator types, you can pass an additional argument to the **threatqmatchiocs** module as shown below. This allows you to make the saved search use only a specific indicator type. Again, as before, you can then make multiple copies of the saved searches and have each one handle only specific ThreatQuotient indicator types. You are free to pass a single indicator type, or a comma separated list as shown below.

**Splunk Search for Listing TQ Indicators**

```
index=<my_index> `threatq_match_sourcetypes` source-
type!="threatq:indicators" | threatqmatchiocs indicator_types-
='IP Address, FQDN'(threatq_match_indicators saved search)
index=<my_index> `threatq_match_sourcetypes` source-
type!="threatq:indicators" | threatqmatchiocs is_update=true
indicator_types='IP Address, FQDN'(threatq_update_matched_
indicators saved search)
```

Finally, both these techniques for scaling the App are equally applicable for the **datamodel mode** as well.

# Dashboards

Preconfigured dashboards, Threat Dashboard and Indicator Dashboard, are packaged with **ThreatQuotient App** to allow the analyst versatile visual representation of all indicator data from ThreatQ and the corresponding sightings. These dashboards are only a suggestion and can be modified via Splunk's standard dashboard editing capability to meet your needs.

You can also access several shortcut options and search tools via the Info tab.

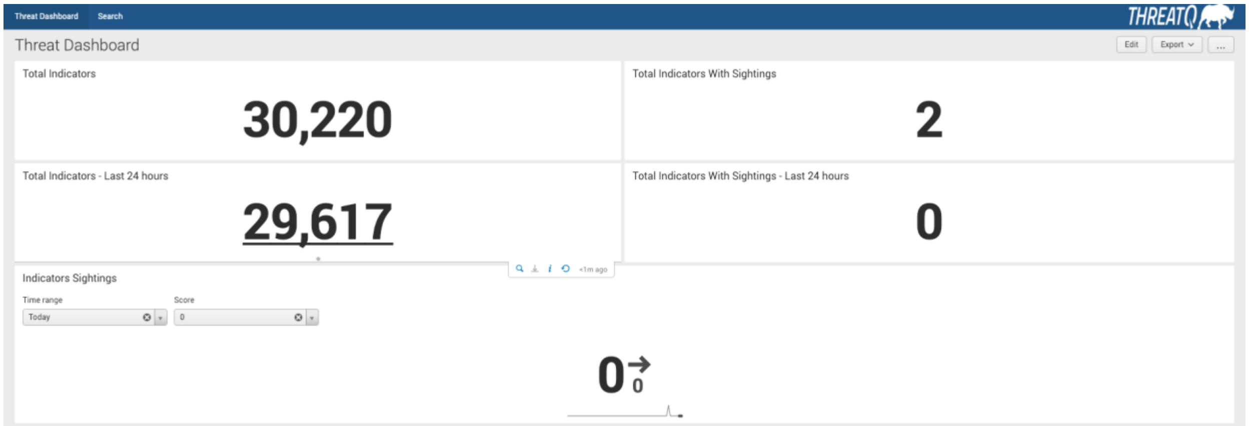
# Threat Dashboards

The Threat Dashboard displays indicator sighting-related information such as:

- Cumulative Counts
- Score Breakdown
- Type Breakdown
- Source Breakdown
- Adversaries Breakdown
- Static Table View
- Top 10 By Sightings

## Cumulative Counts

The top section of the dashboard shows total count for all ThreatQ indicators in the **master lookup table** (on the left) and the **match lookup table** (in the right) (all time and the last 24 hours). It is important to note that the data displayed as Sightings are not the total sightings; rather it is the total number of indicators for which evidence of sightings has been found. Example screen capture below.



Threat Dashboard

Total Indicators
30,220

Total Indicators With Sightings
2

Total Indicators - Last 24 hours
29,617

Total Indicators With Sightings - Last 24 hours
0

Indicators Sightings

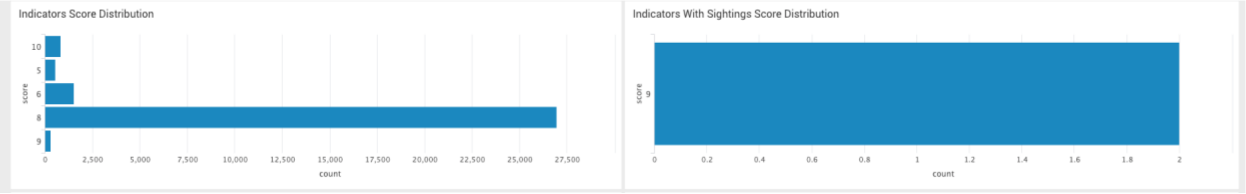
Time range: Today

Score: 0

0 → 0

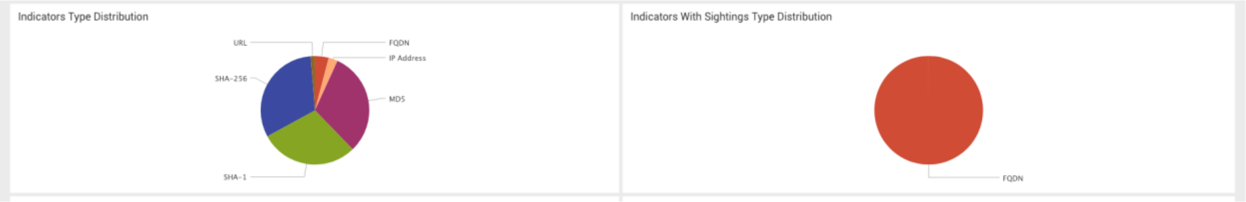
## Score Breakdown

The next section shows the distribution of indicator scores for indicators in master and match lookup tables as bar charts. Example screenshot below. These charts do not have a time filter. The counts for individual score breakdown represent the cumulative indicator count. As an example, notice that there are two indicators with sightings each with score 9 (which matches up with the cumulative sightings count of 2 in the chart above).



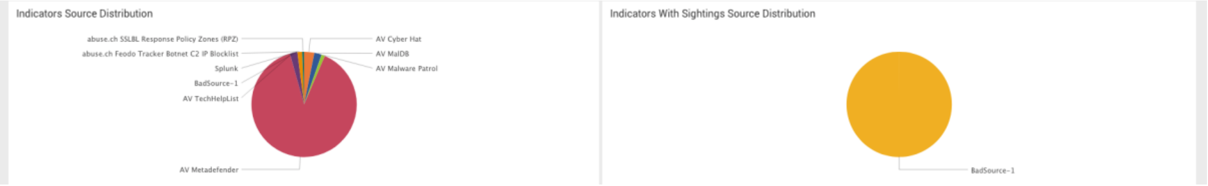
## Type Breakdown

This section shows the distribution of indicator types for indicators in master and match lookup tables as pie charts. As the score distributions above, these are cumulative distributions. Example screenshot below. Hovering over each portion of the pie chart will display the indicator count for that specific portion.


Indicators Type Distribution
URL
FQDN
IP Address
SHA-256
MD5
SHA-1
Indicators With Sightings Type Distribution
FQDN

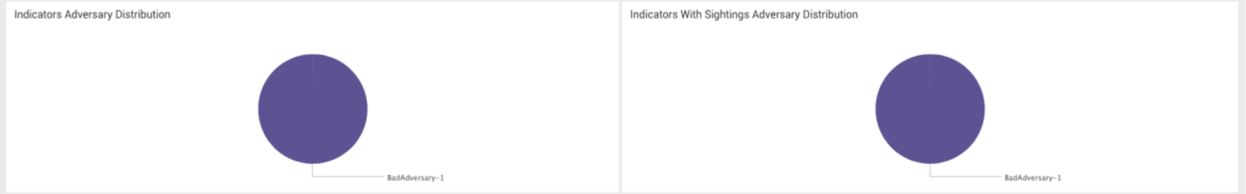
## Source Breakdown

This section shows the breakdown of indicators and sighted indicators by sources. Example screenshot below. One thing to note here is that all indicators must have at least one source, but some indicators may have more than one. For this reason, the cumulative counts in the charts below may exceed the total number of indicators and sighted indicators in the lookup tables.


Indicators Source Distribution
abuse.ch SSLBL Response Policy Zones (RPZ)
abuse.ch Feodo Tracker Botnet C2 IP Blocklist
Splunk
BadSource-1
AV TechHelpList
AV Cyber Hat
AV MalDB
AV Malware Patrol
AV Metadefender
Indicators With Sightings Source Distribution
BadSource-1

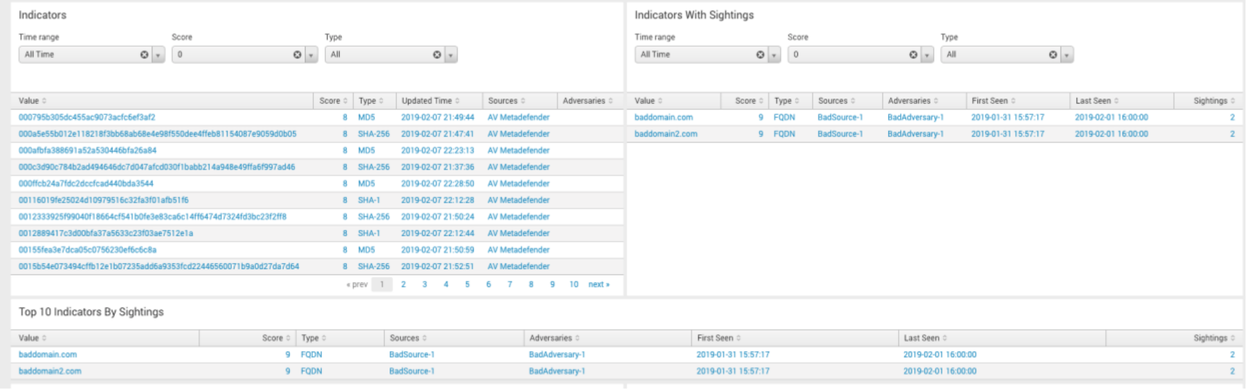
## Adversaries Breakdown

This section shows the breakdown of indicators and sighted indicators by adversaries.  Example screenshot below. One thing to note here is that not all indicators have adversaries; although some indicators may have more than one. Depending upon how many indicators have adversaries, the total cumulative counts in the charts below may be less or more than the total indicators and sighted indicators in the lookup tables. For the example dataset below, there is only one adversary assigned to a few indicators, and those same indicators are sighted.



## Static View Table

This section shows all indicators and sightings in static tables - time filters are provided and defaulted to the last 24 hours. Score and type filters are also available for both. This information gives a threat analyst a single place to view all sightings in Splunk. In the screenshot below, notice there are two indicators sighted, each with 2 sightings.



Indicators

Time range: All Time
Score: 0
Type: All

| Value | Score | Type | Updated Time | Sources | Adversaries |
|---|---|---|---|---|---|
| 000795b305dc455ac9073acfc6ef3af2 | 8 | MD5 | 2019-02-07 21:49:44 | AV Metadefender | |
| 000a5e55b012e118218f3bb68ab68e4e98f550dee4ffeb81154087e9059d0b05 | 8 | SHA-256 | 2019-02-07 21:47:41 | AV Metadefender | |
| 000afbfa388691a52a530446bfa26a84 | 8 | MD5 | 2019-02-07 22:23:13 | AV Metadefender | |
| 000c3d90c784b2ad494646dc7d047afcd030f1babb214a948e49ffa6f997ad46 | 8 | SHA-256 | 2019-02-07 21:37:36 | AV Metadefender | |
| 000ffcb24a7fdc2dccfcad440bda3544 | 8 | MD5 | 2019-02-07 22:28:50 | AV Metadefender | |
| 00116019fe25024d10979516c32fa3f01afb51f6 | 8 | SHA-1 | 2019-02-07 22:12:28 | AV Metadefender | |
| 0012333925f99040f18664cf541b0fe3e83ca6c14ff6474d7324fd3bc23f2ff8 | 8 | SHA-256 | 2019-02-07 21:50:24 | AV Metadefender | |
| 0012889417c3d00bfa37a5633c23f03ae7512e1a | 8 | SHA-1 | 2019-02-07 22:12:44 | AV Metadefender | |
| 00155fea3e7dca05c0756230ef6c6c8a | 8 | MD5 | 2019-02-07 21:50:59 | AV Metadefender | |
| 0015b54e073494cffb12e1b07235add6a9353fcd22446560071b9a0d27da7d64 | 8 | SHA-256 | 2019-02-07 21:52:51 | AV Metadefender | |

« prev 1 2 3 4 5 6 7 8 9 10 next »

Indicators With Sightings

Time range: All Time
Score: 0
Type: All

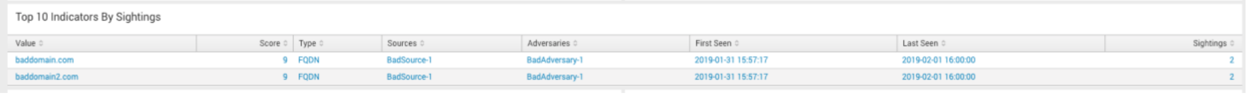
| Value | Score | Type | Sources | Adversaries | First Seen | Last Seen | Sightings |
|---|---|---|---|---|---|---|---|
| baddomain.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |
| baddomain2.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |

Top 10 Indicators By Sightings

| Value | Score | Type | Sources | Adversaries | First Seen | Last Seen | Sightings |
|---|---|---|---|---|---|---|---|
| baddomain.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |
| baddomain2.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |

## Top 10 By Sightings

The final section displays top 10 indicators by sightings, top 10 sources by sightings and top 10 adversaries by sightings in form of a static table, bar chart and bar chart respectively. This information gives an analyst a quick view of the indicator's sources and adversaries with the most matches within Splunk.

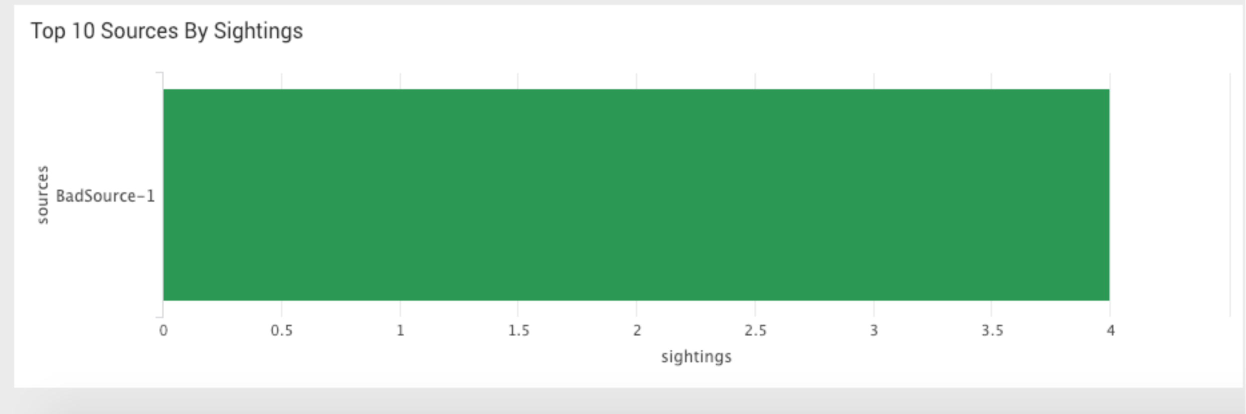


Top 10 Indicators By Sightings

| Value | Score | Type | Sources | Adversaries | First Seen | Last Seen | Sightings |
|---|---|---|---|---|---|---|---|
| baddomain.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |
| baddomain2.com | 9 | FQDN | BadSource-1 | BadAdversary-1 | 2019-01-31 15:57:17 | 2019-02-01 16:00:00 | 2 |

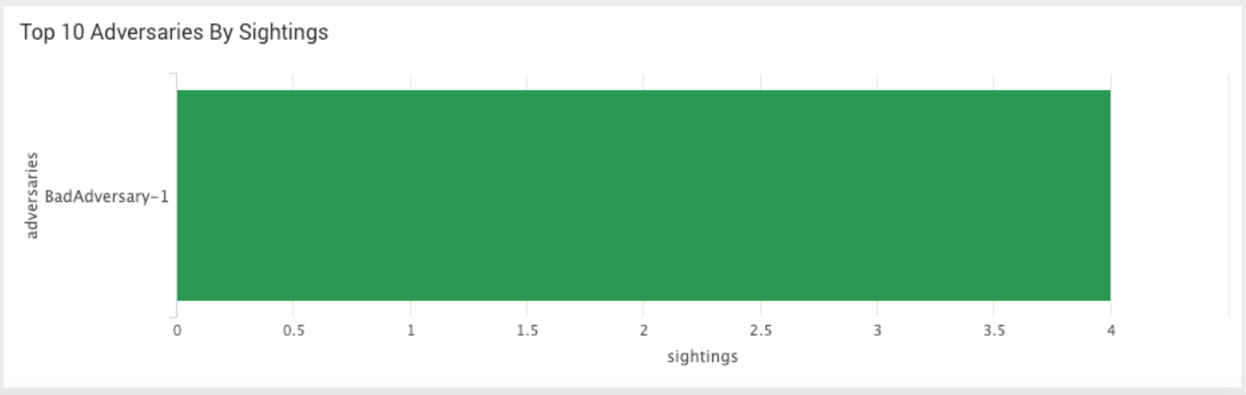
## Sources

Example screenshot below. Notice the source **BadSource-1** appears as the top source with sightings corresponding to the sighted indicators as displayed in the static table above. Also notice that the sightings count is 4, which corresponds to 2 sightings each for the sighted indicators.



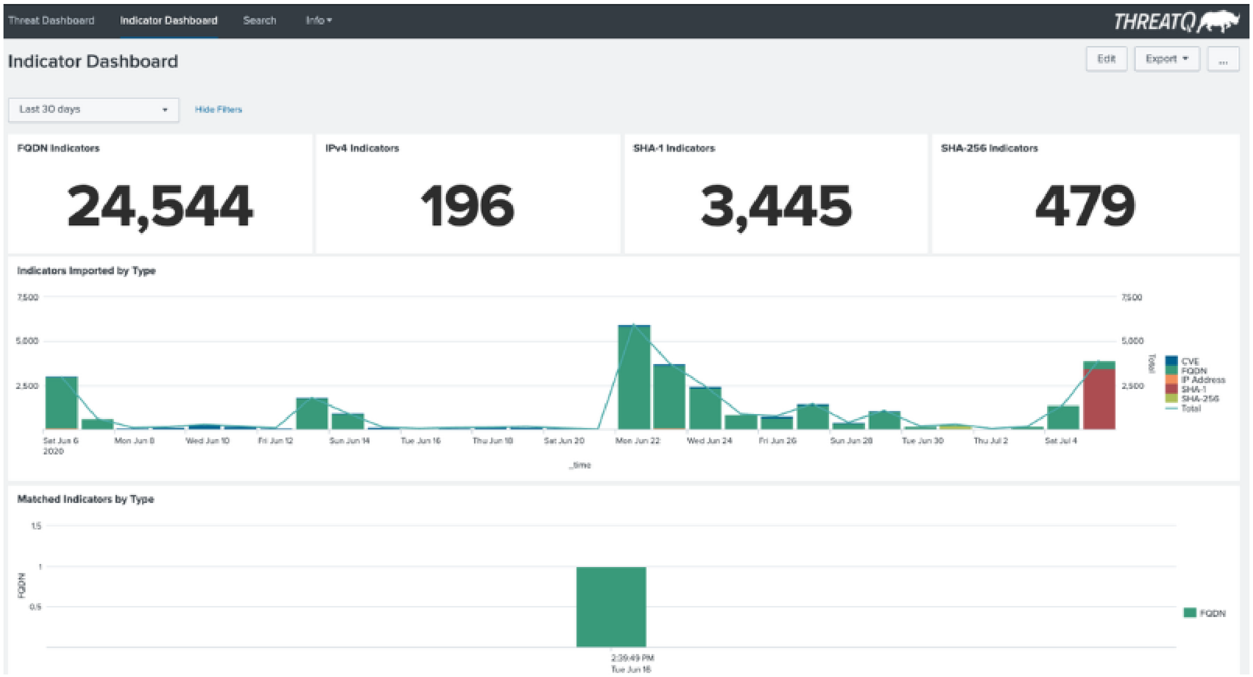
## Adversaries

Example screenshot below. Notice the source **BadAdversary-1** appears as the top adversary with sightings corresponding to the sighted indicators as displayed in the static table above. Also notice that the sightings count is 4, which corresponds to 2 sightings each for the sighted indicators.



# Indicator Dashboard

The Indicator Dashboard displays indicator-related widgets, such as type counts and bar charts, for a user-specified time frame.



FQDN Indicators 24,544

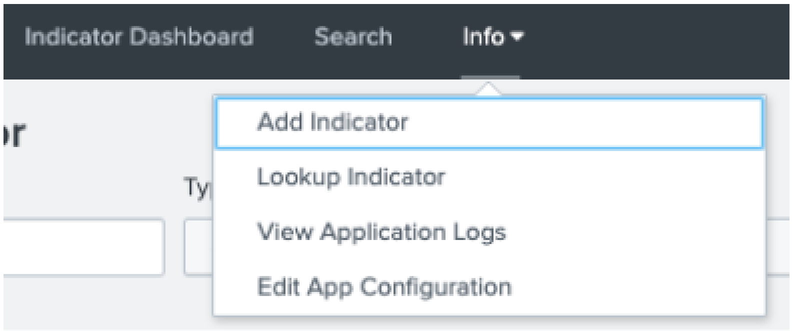
IPv4 Indicators 196

SHA-1 Indicators 3,445

SHA-256 Indicators 479

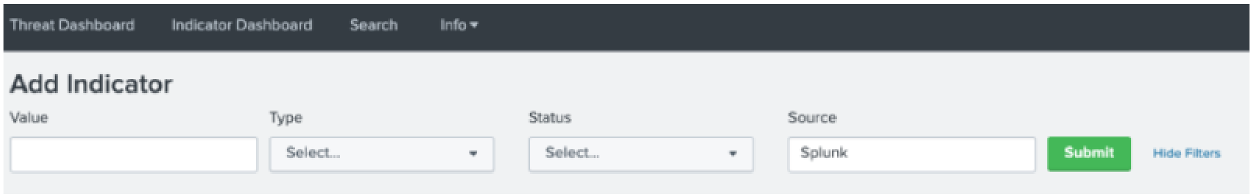
## Info Tab

The Dashboard Info tab, located next to the Search Option, provides you with the ability to perform indicator and application log searches along with shortcuts to the Add Indicator and Edit App Configuration functions.



## Add Indicator

The Add Indicator option will open the Add Indicator input from within the dashboard. You can use this form to manually add indicators to ThreatQ.



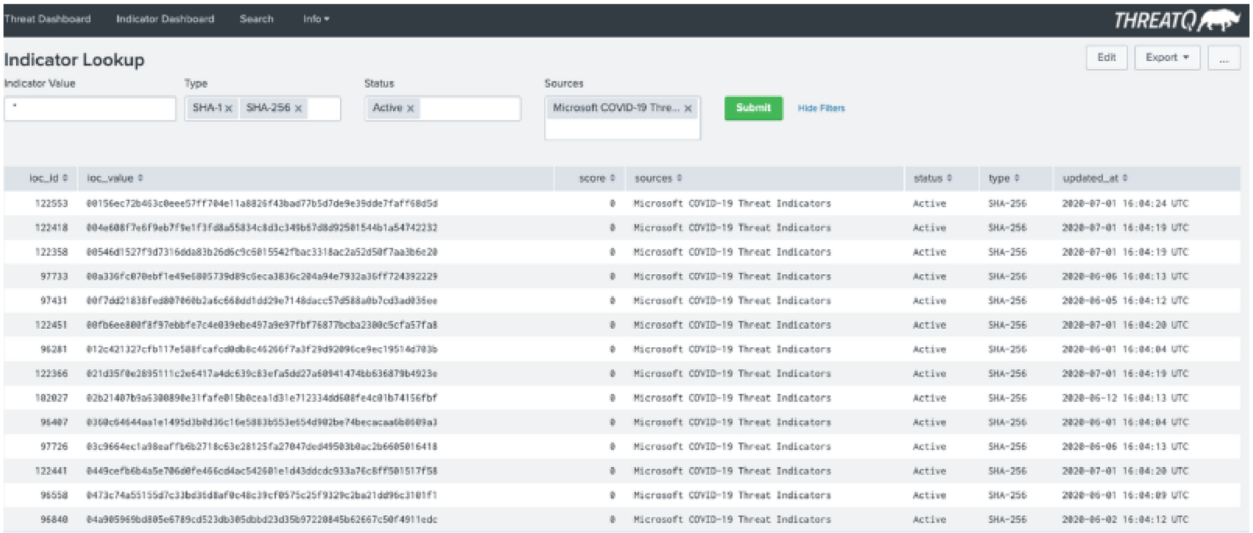
Add Indicator

| Value | Type | Status | Source |
|---|---|---|---|
| | Select... | Select... | Splunk |

## Indicator Lookup

The Indicator Lookup option allows you to perform a search based on:

- IndicatorValue
- IndicatorType
- Status
- Source(s)



Indicator Lookup

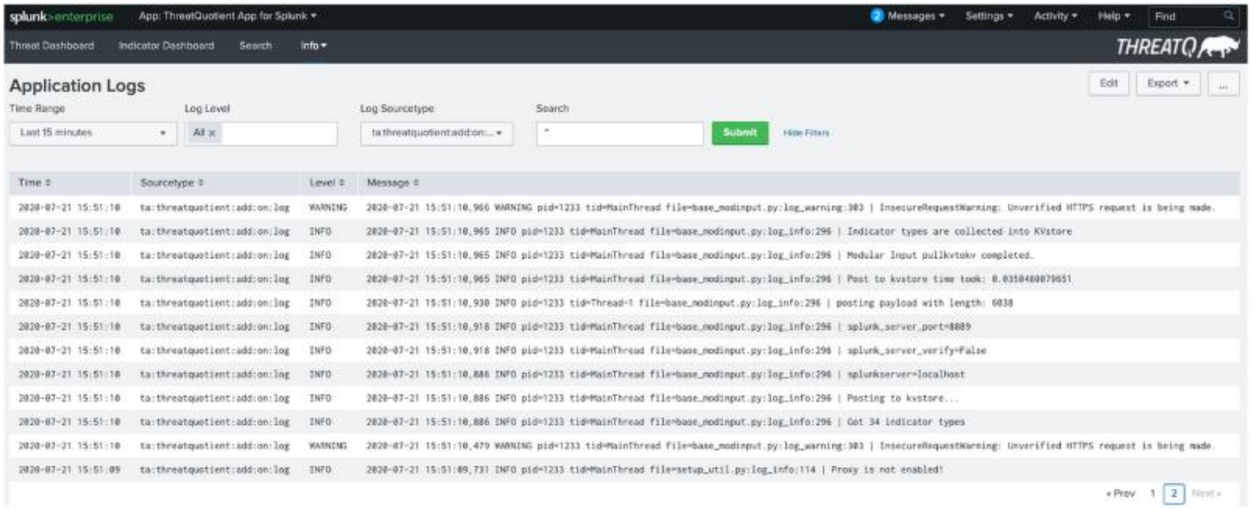
| Indicator Value | Type | Status | Sources |
|---|---|---|---|
| * | SHA-1 x SHA-256 x | Active x | Microsoft COVID-19 Thre... x |

| ioc_id | ioc_value | score | sources | status | type | updated_at |
|---|---|---|---|---|---|---|
| 122553 | 00156ec72b463c0eee57ff704e11a8826f43bad77b5d7de9e39dde7faff68d5d | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:24 UTC |
| 122418 | 004e608f7e6f9eb7f9e1f3fd8a55834c8d3c349b67d8d92501544b1a54742232 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:19 UTC |
| 122358 | 00546d1527f9d7316dda83b26d6c9c6015542fbac3318ac2a52d50f7aa3b6e20 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:19 UTC |
| 97733 | 00a336fc070ebf1e49e6005739d89c6eca3836c204a94e7932a36ff724392229 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-06 16:04:13 UTC |
| 97431 | 00f7dd21838fed007060b2a6c668dd1dd29e7148dacc57d588a0b7cd3ad036ee | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-05 16:04:12 UTC |
| 122451 | 00fb6ee800f8f97ebbfe7c4e039ebe497a9e97fbf76877bcba2300c5cfa57fa8 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:20 UTC |
| 96281 | 012c421327cfb117e588fcafcd0db8c46266f7a3f29d92096ce9ec19514d703b | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-01 16:04:04 UTC |
| 122366 | 021d35f0e2895111c2e6417a4dc639c83efa5dd27a60941474bb636879b4923e | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:19 UTC |
| 102027 | 02b21407b9a6300890e31fafe015b0cea1d31e712334dd608fe4c01b74156fbf | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-12 16:04:13 UTC |
| 96407 | 0360c64644aa1e1495d3b0d36c16e5883b553e654d902be74becacaa6b0609a3 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-01 16:04:04 UTC |
| 97726 | 03c9664ec1a98eaffb6b2718c63e28125fa27047ded49503b0ac2b6605016418 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-06 16:04:13 UTC |
| 122441 | 0449cefb6b4a5e706d0fe466cd4ac542601e1d43ddcdc933a76c8ff501517f58 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-07-01 16:04:20 UTC |
| 96558 | 0473c74a55155d7c33bd36d8af0c48c39cf0575c25f9329c2ba21dd96c3101f1 | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-01 16:04:09 UTC |
| 96840 | 04a905969bd805e6789cd523db305dbbd23d35b97220845b62667c50f4911edc | 0 | Microsoft COVID-19 Threat Indicators | Active | SHA-256 | 2020-06-02 16:04:12 UTC |

## Application Log Search

The Application Log Search allows you to perform a search of logs based on:

- Time Range
- Log Level
- Log Source Type
- Search



Application Logs

Time Range: Last 15 minutes

Log Level: All

Log Sourcetype: ta:threatquotient:add:on:...

Search: *

| Time | Sourcetype | Level | Message |
|---|---|---|---|
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | WARNING | 2020-07-21 15:51:10,966 WARNING pid=1233 tid=MainThread file=base_modinput.py:log_warning:303 \| InsecureRequestWarning: Unverified HTTPS request is being made. |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,965 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| Indicator types are collected into KVstore |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,965 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| Modular Input pullkvtokv completed. |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,965 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| Post to kvstore time took: 0.0350480079651 |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,930 INFO pid=1233 tid=Thread-1 file=base_modinput.py:log_info:296 \| posting payload with length: 6038 |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,918 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| splunk_server_port=8089 |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,918 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| splunk_server_verify=False |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,886 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| splunkserver=localhost |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,886 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| Posting to kvstore... |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:10,886 INFO pid=1233 tid=MainThread file=base_modinput.py:log_info:296 \| Got 34 indicator types |
| 2020-07-21 15:51:10 | ta:threatquotient:add:on:log | WARNING | 2020-07-21 15:51:10,479 WARNING pid=1233 tid=MainThread file=base_modinput.py:log_warning:303 \| InsecureRequestWarning: Unverified HTTPS request is being made. |
| 2020-07-21 15:51:09 | ta:threatquotient:add:on:log | INFO | 2020-07-21 15:51:09,731 INFO pid=1233 tid=MainThread file=setup_util.py:log_info:114 \| Proxy is not enabled! |

## Edit App Configuration

The Edit App Configuration open will open the app's Setup page. See the ThreatQuotient App for more details.

# Troubleshooting

- To troubleshoot ThreatQuotient Add-on please check the log file below:

```
$SPLUNK_HOME/var/log/Splunk/ta_threatquotient_add_on_threatq_indicators.log
```

- To find all unique indicators indexed in Splunk by the Add-On (Splunk App allows you to select a specific time range):

```
sourcetype="threatq:indicators" | dedup value
```

- To check the data collected by data collection use query like:

```
"index=your_index_name sourcetype=threatq_indicators"
```

- Make sure all the saved searches are enabled.
- Make sure the macro is updated as per the settings.
- The log file can be found at the following location:

```
/opt/splunk/var/log/splunk/scheduler.log
```

- If the user changes macros for global score and status thresholds, the audit logs can be accessed using the following two saved searches:

  Splunk Search for Listing TQ Indicators

```
index=_internal threatq_score_filter sourcetype="splunkd_ui_access"

index=_internal threatq_score_filter sourcetype="splunkd_access"
```

# Change Log

**Version 2.2.0**

- A Hostname configuration field has been added to the Setup page. This value will be used as a Source Attribute when calling consume endpoints.
- Saved Searches have been staggered to prevent encountering concurrent search limitations.
- Added a Malware family attribute field to the KVStore.
- Added partial URL matching support for Datamodel searches.
- Combined saved searches for Datamodel to have only a single search per Datamodel.

**TA-threatquotient-add-on: Version 2.3.0**

- Fixed an authentication issue with the KVStore configuration.
- Malware family data, if available for ThreatQ indicators, will now be stored in the KVStore.
- The localhost Username and Password dependency for the KVStore data collection has been removed.

**Version 2.1.0**

- Added new Indicator Dashboard.
- Added ability to use KVStore for saving data.
- Added Info tab to dashboards page with the following options/shortcuts:
    - Add Indicator
    - Lookup Indicator
    - View Application Logs
    - Edit App Configurations
- Fixed an issue where no sightings were generated for domain object types within Splunk.
- Fixed an issue with data listed in multi-valued fields.

**TA-threatquotient-add-on: Version 2.2.0**

- Added new Splunk KVStore Rest configuration tab. This configuration tab is required if users save data to KVStore.

- Additional options Enable Index and Pull all Indicators available under input configuration.

**TA-threatquotient-add-on: Version 2.1.0**

- Import timeout is now configurable from UI
- Pagination support for initial import of ThreatQ data
- Updated default frequency for ThreatQ Exports from 300 to 900

**Version 2.0.0**

- Python 3 Support - ThreatQuotient App for Splunk is now compatible with Python 3. Supported versions include:
    - Splunk 7.2.x
    - Splunk 7.3.x
    - Splunk 8.X (Python 2)
    - Splunk 8.X (Python 3)

**TA-threatquotient-add-on: Version 2.0.0**

- Python 3 Support - ThreatQuotient Add-on for Splunk is now compatible with Python 3. Supported versions include:
    - Splunk 7.2.x
    - Splunk 7.3.x
    - Splunk 8.X (Python 2)
    - Splunk 8.X (Python 3)
- Resolved an issue where creating an indicator in Splunk would occasionally result in the creation of an indicator with an incorrect type within the ThreatQ platform.

**Version 1.3.0**

- Threat Intelligence support for Enterprise Security is now provided using its REST APIs

**Version 1.2.0**

- Added the following contextual data to Indicators:
- Splunk Sighting Timestamp - Last seen value
- Match Count

- The Source for sighted indicators is now reported as Splunk in ThreatQ.
- Added Macro Configuration option to App Setup page. Users now have the ability to select indices, the location they want to search.

  **Note:** If you have the macro configuration for threatq_match_indices set to *, you will need to update the app configuration upon upgrade to 1.2.0 and add the required indexes where matching should take place with ThreatQ indicators. This step is mandatory for the app to continue to perform matching against the required indexes.
- Added Sighting Event Configuration option to the App Setup page. Users now have the ability to configure how the app create events for a sighted indicator.
- Added a new Saved Search - threatq_consume_indicators_new

**TA-threatquotient-add-on: Version 1.1.2**

- Certificate-based errors will no longer appear in the Splunk log. They will now be added as a warning in the ThreatQ application log.

**TA-threatquotient-add-on: Version 1.1.1**

- We have fixed an issue where Splunk credential parsing was generating a 500 error and leaving the configuration page in an unusable state.

**Version 1.1.0**

- The ThreatQuotient Splunk integration now includes support for the Common Information Model (CIM). For users who map third party data (firewall events, logs, for example) to Splunk's data models in CIM, this App provides optimized performance by leveraging those data models. As such, we now support the CIM Data Model Search. We have enhanced Enterprise Security (ES) support to provide single-click enablement within the ThreatQ App for Splunk application settings.

  We have fixed issues where:
- Users could not re-enable and use searches without crashing Splunk ES search head.threatq_match_indicators searches failed to complete. All saved search queries for matching can now accept an optional argument called indicator_types that allows users to match only specific indicator types from ThreatQ.

**Version 1.0.1**

- During authentication, users can now specify whether to verify or disable the SSL certificate.