



## Splunk Integration For Databricks

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Installation And Usage Guide 1.2.0

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<b>Overview</b>	<b>4</b>
<b>Compatibility Matrix</b>	<b>4</b>
<b>System Requirements</b>	<b>5</b>
<b>Installation</b>	<b>5</b>
<b>Configuration</b>	<b>5</b>
Configure Proxy Details	6
Configure Databricks Credentials	7
Prerequisites for configuration via Azure Active Directory:	7
Configure Logging	10
<b>Executing custom commands</b>	<b>11</b>
databricksquery	11
databricksrun	12
databricksjob	13
databricksretiredrun	14
<b>Lookups</b>	<b>15</b>
<b>Macro</b>	<b>15</b>
<b>Saved Search</b>	<b>15</b>
<b>Dashboards</b>	<b>15</b>
<b>Alert action</b>	<b>17</b>
<b>Upgrade instructions</b>	<b>18</b>
Upgrade from Databricks Add-On for Splunk v1.1.0 to v1.2.0	18
<b>Known Issues</b>	<b>18</b>
<b>Limitations</b>	<b>18</b>
<b>Troubleshooting</b>	<b>19</b>
<b>Uninstall &amp; Cleanup Steps</b>	<b>20</b>

# Overview

Databricks is a unified data analytics platform used for processing and transforming massive quantities of data and exploring the data through machine learning models. It offers a data science workspace, SQL analytics, unified data service, and enterprise cloud services. For more details visit [here](#).

Splunk is a software platform that enables users to search, analyze, and visualize the data gathered from the components of their IT infrastructure or business. It takes in data from websites, applications, sensors, devices, and so on. After you define the data source, Splunk Enterprise indexes the data stream and parses it into a series of individual events that you can view and search. For more details visit [here](#).

With “Splunk Integration For Databricks”, users will be able to:

- Ingest their data present in Databricks delta table into Splunk
- Query their data present in Databricks delta table from Splunk
- Execute Databricks notebooks from Splunk

This integration will consist of mainly 2 things:

- A Splunk application that'll manage authentication with Databricks, provide custom commands to submit queries and jobs in Databricks.
- A Databricks notebook using which users can push their data in the Databricks delta table to Splunk.

## Compatibility Matrix

Splunk Version	Operating System	Databricks Runtime	Databricks API Version
8.2	CentOS, Ubuntu, Windows 10, Windows Server 2019	7.3	<ul style="list-style-type: none"><li>• REST API 1.2 for command execution</li><li>• REST API 2.0 for the rest of the features</li></ul>
9.0	CentOS, Ubuntu, Windows 10, Windows Server 2019	7.3	<ul style="list-style-type: none"><li>• REST API 1.2 for command execution</li><li>• REST API 2.0 for the rest of</li></ul>

			the features
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## System Requirements

The system requirements for the Splunk integration are the same as the basic requirements of the Splunk deployment. ([Reference](#))

## Installation

Based on your Splunk deployment, follow the steps mentioned below to install the Splunk applications:

- [Standalone Splunk Deployment](#)
- [Distributed Splunk Deployment](#)

In case of deployment in the search head cluster environment use a deployer to push the apps. Follow the below steps to push the apps to search head cluster members:

- On deployer node, extract the app at \$SPLUNK\_HOME\$/etc/shcluster/apps.
- Create a “shclustering” stanza at path \$SPLUNK\_HOME\$/etc/shcluster/apps/TA-Databricks/local/server.conf and add following information to the stanza: `conf_replication_include.ta_databricks_settings = true` as shown below.

```
[shclustering]
```

```
conf_replication_include.ta_databricks_settings = true
```

- Push the bundle to search head members

If you are using “Distributed Splunk Deployment”, refer to the below table to find where to install which applications:

Splunk Instance Type	Databricks Add-on for Splunk Required?
Heavy Forwarder	-
Indexer/Indexer Cluster	-
Search Head/Search Head Cluster	Yes

# Configuration

Users will be required to have an admin role to configure Databricks Add-on for Splunk. Users without an admin role will not be able to do the Configuration. Users who are not having admin role, for them the Configuration Page won't load but will be able to run the Custom Commands once the Configuration is done by the admin. This integration allows a user to configure multiple pair of Databricks Instance, its credentials and Databricks Cluster Name at a time. In case a user is using the integration in search head cluster environment, configuration on all the search cluster nodes will be overwritten

Once the installation is done successfully, follow the below steps to configure the app.

## Configure Proxy Details

This step is only required if you want to use a proxy server. To configure proxy details:

- Log in to Splunk UI.
- Go to the Configuration page, either by clicking on the name of the add-on on the left navigation banner on the home page or by going to Manage Apps, then clicking Launch app in the row for Databricks Add-on for Splunk.
- Click the Configuration menu and in the Proxy tab, fill in the required details. Refer to the below table to fill in the details.

Input	Required	Description
Enable	Yes	Whether to use a proxy or not
Proxy Type	Yes	Type of proxy Options: http
Host	Yes	Proxy host
Port	Yes	Port to use
Username	No	Username to use for authentication
Password	No	Password for the provided username.
Remote DNS resolution	No	Whether to resolve DNS or not.

Use Proxy for OAuth	No	Check this box if you want to use proxy just for AAD token generation (https://login.microsoftonline.com/). All other network calls will skip the proxy even if it's enabled.
---------------------	----	---

- Click Save.

## Configuration

Set up your add-on

Databricks Credentials	Proxy	Logging
<p>Enable <input type="checkbox"/></p> <p>Proxy Type <input type="text" value="http"/> <input type="button" value="X"/></p> <p>Host <input type="text"/></p> <p>Port <input type="text"/></p> <p>Username <input type="text"/></p> <p>Password <input type="text"/></p> <p>Remote DNS resolution <input type="checkbox"/></p> <p>Use Proxy for OAuth <input type="checkbox"/></p> <p><input type="button" value="Save"/></p>		

## Configure Databricks Credentials

User can authenticate using two ways:

- Using Personal access tokens
- Using Azure Active Directory Tokens

## Prerequisites for configuration via Azure Active Directory:

To configure the Add-on with Azure Active Directory, you need to provision a service principal in Azure Portal and add it to the target Azure Databricks workspace.

- To provision, a service principal, follow [these steps](#)

- When creating a client secret, the default Expiry time for the secret is six months. Six months after the creation of the secret, it will expire and no longer be functional. In this case, the user needs to create a new client secret and configure the Add-on again. Users can also set a custom expiration time larger than the default value while creating the secret. Example: 12 months
- To add the provisioned service principal to the target Azure Databricks workspace, follow [these steps](#) and refer to this [example](#)

**Note:** The service principals must be Azure Databricks workspace users and admins.

To configure Databricks credentials:

- Log in to Splunk UI.
- Go to the Configuration page, either by clicking on the name of the add-on on the left navigation banner on the home page or by going to Manage Apps, then clicking Launch app in the row for Databricks Add-on for Splunk.
- Click the Configuration menu and in the Databricks Credentials tab click on Add, fill in the required details. Refer to the below tables to fill in the details.
  - If Authentication mechanism to be used is Personal access token

Input	Required	Description
Account Name	Yes	Unique name of the account.
Databricks Instance	Yes	URL of Databricks instance to be used.
Authentication Method	Yes	Databricks personal access token to use for authentication.
Databricks Access Token	Yes	Databricks personal access token to use for authentication when authentication method is "Personal Access Token"



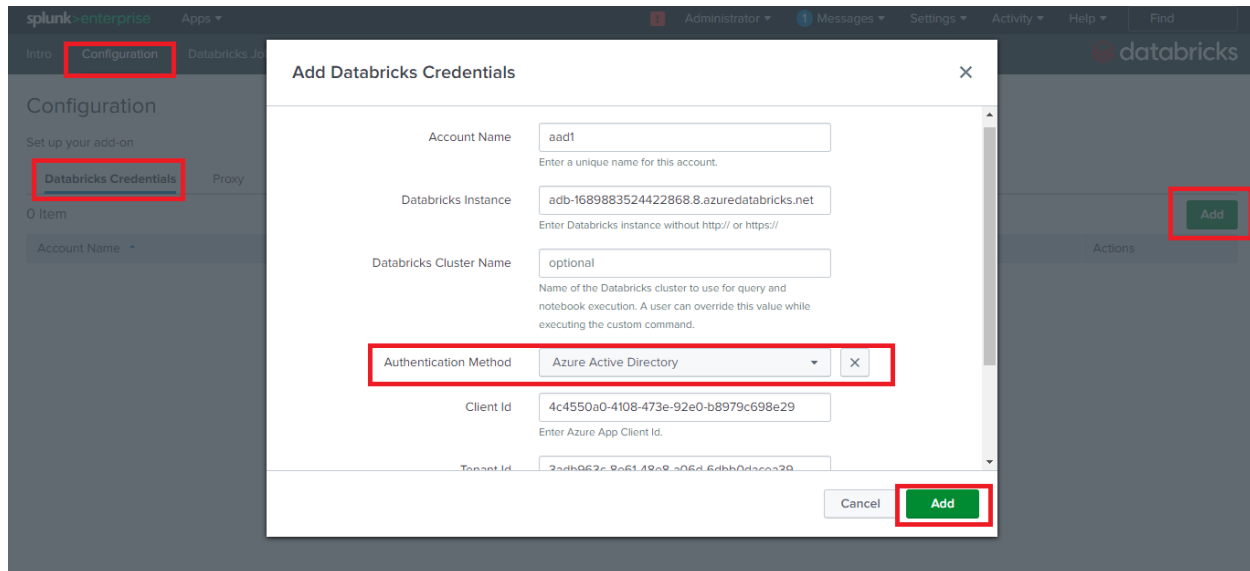
The screenshot shows the Splunk Enterprise interface. On the left, the 'Configuration' page is open, and the 'Databricks Credentials' link is highlighted with a red box. In the center, the 'Add Databricks Credentials' dialog box is displayed. It contains the following fields:
 

- Account Name:** A text input field with the value 'pat1'.
- Databricks Instance:** A text input field with the value 'adb-1689883524422868.8.azure.databricks.net'.
- Databricks Cluster Name:** A text input field with the value 'optional'.
- Authentication Method:** A dropdown menu set to 'Personal Access Token'.
- Databricks Access Token:** A text input field with a masked token '\*\*\*\*\*'.

 The 'Add' button at the bottom right of the dialog is highlighted with a red box. The background shows the Splunk configuration page with a 'Databricks' add-on listed.

- If Authentication mechanism to be used is Azure Active Directory

Input	Required	Description
Account Name	Yes	Unique name of the account.
Databricks Instance	Yes	URL of Databricks instance to be used.
Authentication Method	Yes	Databricks personal access token to use for authentication.
Client Id	Yes	Azure AD Client ID. Required when authentication method is "Azure Active Directory"
Tenant Id	Yes	The application/tenant ID of the registered app in Azure AD you wish to use. Required when authentication method is "Azure Active Directory"
Client Secret	Yes	The client secret from Azure AD. Required when authentication method is "Azure Active Directory"



- Click Add.

**Note:** For validation of the parameters provided, the application will try to get the clusters present in the Databricks instance.

## Configure Logging

To configure Logging:

- Log in to Splunk UI.
- Go to the Configuration page, either by clicking on the name of the add-on on the left navigation banner on the home page or by going to Manage Apps, then clicking Launch app in the row for Databricks Add-on for Splunk.
- Click on the Configuration menu and in the Logging tab, select appropriate Log Level from the dropdown.
- Click Save.

## Configuration

Set up your add-on

Databricks Credentials

Proxy

Logging

Log level

INFO

X

Save

## Executing custom commands

All the users will be able to execute the custom commands.

Once the admin user configures Databricks Add-on for Splunk successfully, all the users can execute custom commands to

- Query their data present in the Databricks table from Splunk.
- Execute Databricks notebooks from Splunk.

Currently, Databricks Add-on for Splunk provides four custom commands. Users can open the Splunk search bar and can execute the commands. Below are the command details.

### databricksquery

This custom command helps users to query their data present in the Databricks table from Splunk.

- **Command Parameters**

Parameter	Required	Overview
account_name	Yes	Configured account name.
cluster	Yes	Name of cluster you want to query data from
query	Yes	SQL query to get data from Databricks delta
command_timeout	No	Timeout for command execution in seconds. Default to 300 seconds

- **Syntax**

```
| databricksquery account_name="<account_name>" cluster="<cluster_name>"
query="<SQL query>" command_timeout=<timeout_in_seconds> | table *
```

- **Output**

The command will give the output of the query in tabular format. It will return an error message in case any error occurs during query execution.

- **Example**

```
| databricksquery account_name="aad1" cluster="Crest Cluster1" query="SELECT *
FROM hive_metastore.default.people_csv" command_timeout=60 | table *
```

The screenshot shows the 'New Search' interface in Databricks. The search bar contains the command: `| databricksquery account_name="aad1" query="SELECT * FROM hive_metastore.default.people_csv" cluster="Crest Cluster1" command_timeout=60 | table *`. Below the search bar, a warning message states: 'Results are truncated due to Databricks API limitations.' The results section shows '1,000 events' for the time range '12/26/22 1:30:00.000 PM to 12/27/22 2:19:16.000 PM'. The results are displayed in a table with columns: Address, City, FirstName, LastName, and PersonID. The first two rows are visible:

Address	City	FirstName	LastName	PersonID
5426 Lawn Place	Kendal	Winnie	Dovidaitis	2
1619 Green Ridge Drive	Dikhill	Perry	Wandrack	3

## databricksrun

This custom command helps users to submit a one-time run without creating a job.

- **Command Parameters**

Parameter	Required	Overview
account_name	Yes	Configured account name.
run_name	No	Name of the submitted run
cluster	Yes	Name of cluster you want to run notebook on
notebook_path	Yes	The absolute path of the notebook to be run in the Databricks workspace. This path must begin with a slash. This field is required.

revision_timestamp	No	The timestamp of the revision of the notebook.
notebook_params	No	Parameters to pass while executing the run. In the form of "key1=value1  key2=value2  ..."

- **Syntax**

```
| databricksrun account_name="<account_name>"
notebook_path="<path_to_notebook>" run_name="<run_name>"
cluster="<cluster_name>" revision_timestamp="<revision_timestamp>"
notebook_params="<params_for_job_execution>" | table *
```

- **Output**

The command will give the details about the executed run through the job.

- **Example**

```
| databricksrun account_name="account_name" notebook_path="/path/to/test_notebook"
cluster="test_cluster" notebook_params="key1=value1||key2=value2" | table *
```

account_name	command_status	created_time	error	identifier	kv_status	output_url	param
aad1	Success	1672131691.2192457	-	-	KV Store updated successfully	https://adb-1689883524422868.8.azuredatabricks.net/?o=1689883524422868#job/1061068515959928/run/147476	account_name=aad1 notebook_path=/Users/dhruvil.bhatt@crestdata.com cluster=Crest Cluster1 notebook_params=a=1  b=2

## databricksjob

This custom command helps users to run an already created job now from Splunk.

- **Command Parameters**

Parameter	Required	Overview
account_name	Yes	Configured account name.
job_id	Yes	Job ID of your existing job in Databricks

notebook_params	No	Parameters to pass while executing the job. In the form of "key1=value1  key2=value2 ..."
-----------------	----	---

- **Syntax**

```
| databricksjob account_name="<account_name>" job_id=<job_id>
notebook_params="<params_for_job_execution>" | table *
```

- **Output**

The command will give the details about the executed run through the job.

- **Example**

```
| databricksjob account_name="account_name" job_id=2
notebook_params="key1=value1||key2=value2" | table *
```

account_name	command_status	created_time	error	kv_status	number_in_job	output_url	param	result_url
aad1	Success	1672132058.554379	-	KV Store updated successfully	149503	https://adb-1689883524422868.8.azuredatabricks.net/?o=1689883524422868#job/83882166223072/run/149503	account_name=aad1 job_id=83882166223072	https://adb-1689883524422868.8.azuredatabricks.net/?o=1689883524422868#job/83882166223072/run/149503

## databricksretiredrun

This command is used to delete the records based on the provided parameter from the submit\_run\_logs lookup, which maintains the details of notebook runs. To run the command at least one of the parameters is required. When all parameters are provided, it will delete the records matching all the parameters together.

- **Command parameters**

Parameter	Required	Overview
account_name	Yes	Configured account name.
days	No	The number of days, records older than which will be deleted from submit_run_log lookup

run_id	No	ID of the submitted run.
user	No	Name of an existing splunk user.

- **Syntax**  
| databricksretiredrun account\_name="<account\_name>" days="<number\_of\_days>" run\_id="<run\_id>" user="<user\_name>"
- **Output**  
The command will delete the details of notebook runs from submit\_run\_log lookup.
- **Example 1**  
| databricksretiredrun account\_name="<account\_name>" days=90
- **Example 2**  
| databricksretiredrun account\_name="<account\_name>" user="john doe"
- **Example 3**  
| databricksretiredrun account\_name="<account\_name>" run\_id="12344"
- **Example 4**  
| databricksretiredrun account\_name="<account\_name>" days=90 user="john doe" run\_id="12344"

## Lookups

The Add-on contains two KV store lookups :**submit\_run\_logs** and **execute\_job\_logs** that store the details of the Notebooks and jobs run using commands **databricksrun** and **databricksjob** respectively.

## Macro

Macro **databricks\_run\_retiring\_days** specifies the days, records older than which will be deleted from submit\_run\_log lookup using saved search **databricks\_retire\_run**. The default value configured is 90 days.

To modify Macro from Splunk UI,

1. Go to **Setting -> Advanced search -> Search Macros**.
2. Select **Databricks Add-on for Splunk** in the App context.
3. Configure the macro by clicking on the **Name** of the Macro, go to the **Definition** field and update it as per requirements.

## Saved Search

Saved search **databricks\_retire\_run** uses the `databricksretiredrun` command to delete the records older than days specified in macro **databricks\_run\_retiring\_days** from the **submit\_run\_logs** lookup. By default, it is invoked once every day at 1:00 hrs and deletes records older than 90 days. The **databricks\_run\_retiring\_days** can be modified to change the default 90 days.

## Dashboards

The dashboard will be accessible to all the users. A user with `admin_all_objects` capability can navigate to

“<splunk\_instance\_host\_or\_ip>:<splunk\_web\_port>/en-US/app/TA-Databricks/dashboards” to modify the permissions for dashboards.

This app contains the following dashboards

### Databricks Job Execution Details:

The dashboard provides the details about the one-time runs and jobs executed using `databricksrun` and `databricksjob` custom commands respectively.

The dashboard uses the following parameters from user

Parameter	Required	Overview
Creation Time Filter	Yes	Time range when the job/notebook was run.
Submission status	Yes	Status of the job/run . Values: Failed, success, All default: All
User Filter	Yes	Name of an existing Splunk use who ran the job/run default: All



Databricks Job Execution Details

Creation Time Filter

Submission Status

User Filter

Hide Filters

Last 24 hours

All

All

Edit

Export

...

Databricks Run Details

	Created Time ↕	User ↕	Notebook Params ↕	Run ID ↕	Submission Status ↕	Output URL ↕	Result URL ↕
1	2022-02-08T14:04:24.014	admin	notebook_path=/Users/0237f3be-20e3-4815-8e5a-91498d6fa7/sum notebook_params=a b=4 cluster=test_cluster identifier=0:scheduler__admin_VEEtRGf0WJyaNrcw__RMD5dedfce05ccb8975_at_1644308760_120	5388	Success	https://adb-1689883524422868.8.azuredatabricks.net/?o=1689883524422868#job/4357/run/5388	https://adb-1689883524422868.8.azuredatabricks.net/?o=1689883524422868#job/4357/run/5388/resultsOnl
2	2022-02-08T14:01:13.980	admin	notebook_path=/Users/0237f3be-20e3-4815-8e5a-91498d6fa7/sum notebook_params=a b=0 cluster=test_cluster identifier=0:scheduler__admin_VEEtRGf0WJyaNrcw__RMD5dedfce05ccb8975_at_1644308760_120	-	Failed	-	-

Databricks Job Details

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1m ago

### Launch Notebook:

The dashboard allows users to execute a notebook on their Databricks cluster by providing the required parameters. The users can then navigate to the results page on the Databricks instance using the link in the dashboard panel.

The dashboard uses the following parameters from user

Parameter	Required	Overview
Notebook Path	Yes	The absolute path of the notebook to be run in the Databricks workspace. This path must begin with a slash.
Notebook revision timestamp	No	The timestamp of the revision of the notebook.
Notebook Parameters	No	Parameters to pass to the notebook. In the form of “key1=value1  key2=value2  ...”
Cluster Name	No	Name of cluster you want to run the notebook on.
Account Name	Yes	Configured account name.
Auto Forward	Yes	Yes - If you directly want to be redirected to the Databricks result URL No - If you want to manually redirect to the Databricks URL by clicking on the URL hyperlink. This is the default selection.

You can refer to the **Launching a Notebook through dashboard** panel in the Intro dashboard for example after the app installation.

**Launch Notebook**

Notebook path:  Notebook revision timestamp:  Notebook Parameters:  Cluster Name:  Account Name:

Auto Forward?

## Alert action

The **Launch Notebook** alert action is used to execute a parameterized notebook based on the provided parameters. The alert can be scheduled or run as ad-hoc. It can also be used as Adaptive response action in **"Enterprise Security > Incident Review dashboard"**.

When this alert action is run as Adaptive response action from **"Enterprise Security > Incident review dashboard"**, a launch\_notebook link will be visible in the Adaptive Responses table in the Incident review dashboard which will redirect to the Launch Notebook dashboard with parameters.

You can refer to the **Launching Notebook through Adaptive Response** panel in the Intro dashboard for example after the app installation.

### Note:

- The redirection will work properly only when the status is in Success state.
- Once the Adhoc-Alert action is run from the **"Enterprise Security > Incident review dashboard"**, in Adhoc mode, you will need to refresh and check for status update.

**Incident Review Events**

Edit Selected | Edit All | Matching Events | Add Selected to Investigation

i	Time	Security Domain	Title	Urgency	Status	Owner	Actions
2/8/22 1:55:58.445 PM	Threat	Databricks Adaptive response example	Low	New	unassigned		

**Description:** unknown

**Additional Fields**

Field	Value
Host	localhost.localdomain
Original Splunk Source	/opt/splunk/var/log/splunk/splunkd_ui_access.log
Severity	unknown
User	admin

**Related Investigations:** Currently not investigated.

**Action**

**Correlation Search:** [Databricks Adaptive response example](#)

**History:** [View all review activity for this Notable Event](#)

**Original Event:**

```
10.0.1.1 - admin [08/Feb/2022:13:55:58.445 +0530] "GET /en-US/splunkd/_raw/services/server/health/splunkd?output_mode=json&_id=1644308727654 HTTP/1.1" 200 410 "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/97.0.4692.99 Safari/537.36" - 7d9384e0b9d15a408209d5257f7d2103 1ms
```

[View original event](#)

**Adaptive Responses:**

Response	Mode	Time	User	Status
Launch Notebook	adhoc	2022-02-08T14:04:08+0530	admin	success

## Upgrade instructions

### General upgrade steps:

- Log in to Splunk Web and navigate to Apps -> Manage Apps.
- Click Install app from file.

- Click Choose file and select the Databricks Add-on for Splunk installation file.
- Check the Upgrade checkbox.
- Click on Upload.
- Restart Splunk.

## Upgrade from Databricks Add-On for Splunk v1.1.0 to v1.2.0

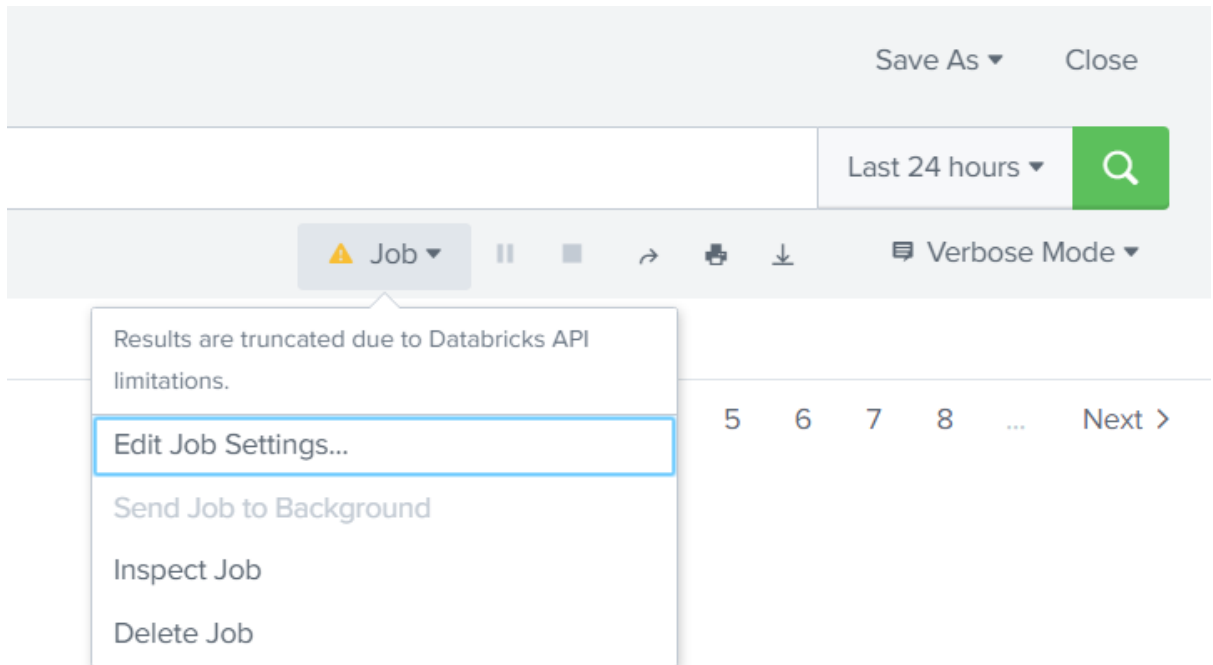
- Follow the below steps to upgrade the Add-on to 1.2.0
  - Follow the General upgrade steps section..
  - Login with the user having an 'admin' role.
  - Navigate to Databricks Add-on for Splunk > Configuration.
  - Click on Add button, and reconfigure account with required information.
  - The logged in user will now be able to execute any custom commands.
  - Login with the user without an 'admin' role.
  - The logged in user will now be able to execute any custom commands.

## Known Issues

- When the commands fail, sometimes an indistinct/unclear error message is displayed in UI, not giving a precise reason for the failure. To troubleshoot such cases, please check the logs at \$SPLUNK\_HOME/var/log/TA-Databricks/<command\_name>\_command.log to get the precise reason for the failure.
- When the Adaptive response action `Launch Notebook` is run more than once for the same notable event in Enterprise Security security, clicking on any of the `launch\_notebook` links will redirect to the Launch Notebook dashboard with the latest run details.

## Limitations

- The Databricks API used in the `databricksquery` custom command has a limit on the number of results to be returned. Hence, sometimes the results obtained from this custom command may not be complete.



## Troubleshooting

- Instance URL should not start with scheme: Provide a Databricks instance without HTTP/HTTPS scheme. HTTPS scheme will be hard-coded before making any network calls.
- Unable to request Databricks instance. Please validate the provided Databricks and Proxy configurations or check the network connectivity.
- Configuration page failed to load, the server reported internal errors which may indicate you do not have access to this page.
- Invalid access token. Please enter the valid access token: Provided Access token is not a valid token. Please verify the token.
- Addon is not configured. Navigate to addon's configuration page to configure the addon.
- Error in SQL statement. AnalysisException. Table or view not found: You have entered invalid table name or invalid database name.
- API limit exceeded. Please try again after some time: You have made too many requests and the API limit has been exceeded.
- MaxContextException: Too many execution contexts are open right now: You have requested too many executions. Please try again after some time.
- Ensure that the cluster is in the running state. Current cluster state is {Terminated/Pending}
- No cluster found with name {cluster\_name}. Provide a valid cluster name.
- Given job does not contain the notebook task. Hence terminating the execution.
- Databricks cluster is required to execute this custom command. Provide a cluster parameter or configure the cluster in the TA's configuration page.

- Could not complete the query execution. Status {Cancelled/Error}: Submitted SQL query could not complete the execution on Databricks instance and returned error.
- Encountered unknown result type, terminating the execution: The SQL query returned something else other than the tabular result, which cannot be parsed by Splunk.
- Command execution timed out: The SQL query could not return anything. Try re-running the command after increasing the value for `command_timeout` parameter.
- Authentication Failure: Check the network connectivity and verify that the details provided for the authentication mechanism are correct.
- The Add-on does not require a restart after the installation for all functionalities to work. However, the icons will be visible after one Splunk restart post-installation.
- If all custom commands/notebooks fail to run with HTTPS response code [403] then most probably the client secret has expired. Please regenerate your client secret in this case on your Azure portal and configure the add-on again with the new client secret. Set the client secret's expiration time to a custom value that you see fit. Refer to this [guide](#) for setting a client secret in Azure Active Directory.
- For any other unknown failure, please check the log files `$SPLUNK_HOME/var/log/ta_databricks*.log` to get more details on the issue.
- If proxy is enabled and Use Proxy for OAuth is checked, and custom commands fail to run and throw the below mentioned error.  
`HTTPSConnectionPool(host=<host>, port=443): Max retries exceeded with url: <url> (Caused by NewConnectionError('<urllib3.connection.HTTPSConnection object at 0x7fd9a01fb050>: Failed to establish a new connection: [Errno 110] Connection timed out'))`  
 In this case, uncheck 'Use Proxy for OAuth' and save the Proxy configuration and re-run the custom command again.

## Uninstall & Cleanup Steps

- Remove `$SPLUNK_HOME/etc/apps/TA-Databricks/`
- Remove `$SPLUNK_HOME/var/log/TA-Databricks/`
- Remove `$SPLUNK_HOME/var/log/splunk/**ta_databricks*.log**`
- To reflect the cleanup changes in UI, restart Splunk instance. Refer to [Start Splunk](https://docs.splunk.com/Documentation/Splunk/8.0.6/Admin/StartSplunk) documentation to get information on how to restart Splunk.

**Note:** `$SPLUNK_HOME` denotes the path where Splunk is installed. Ex: `/opt/splunk`