

CSA Operator Overview

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What is CSA Operator?

Cloudera Streaming Analytics (CSA) Operator allows you to deploy and manage the Streaming Analytics components of Cloudera Data Platform (CDP), Flink and SQL Stream Builder (SSB), as container applications on Kubernetes.

CSA Operator is based on the Apache Flink Kubernetes Operator (Flink Operator), and offers the same set of features as the Flink Operator supports. By extending the Kubernetes API, the Flink Operator acts as a control plane to manage the deployment lifecycle of Flink applications using the operator pattern. The current release of CSA Operator also includes a Technical Preview of the SQL Stream Builder, which will become a standard component of CSA Operator in future versions.

The operator pattern is a specialized controller used to manage a custom resource. As a customized control loop, controllers watch the shared state of the cluster through an API server to make changes in order to reach the desired state of the deployment defined by the custom resources. Building on default Kubernetes components, custom resources enable customization of the Kubernetes installation specialized for the application. This enables the Flink deployment process to be automated to start clusters, deploy stateful jobs, and ensure stability.

**Note:**

Due to the potential for confusion between the different meanings of "operator," references in the CSA Operator documentation use the following terminology:

- CSA Operator: refers to the CSA Operator product
- Flink Operator: refers to the Apache Flink Kubernetes Operator component
- operator: refers to the function of the Flink to transform one or more DataStreams into a new DataStream.

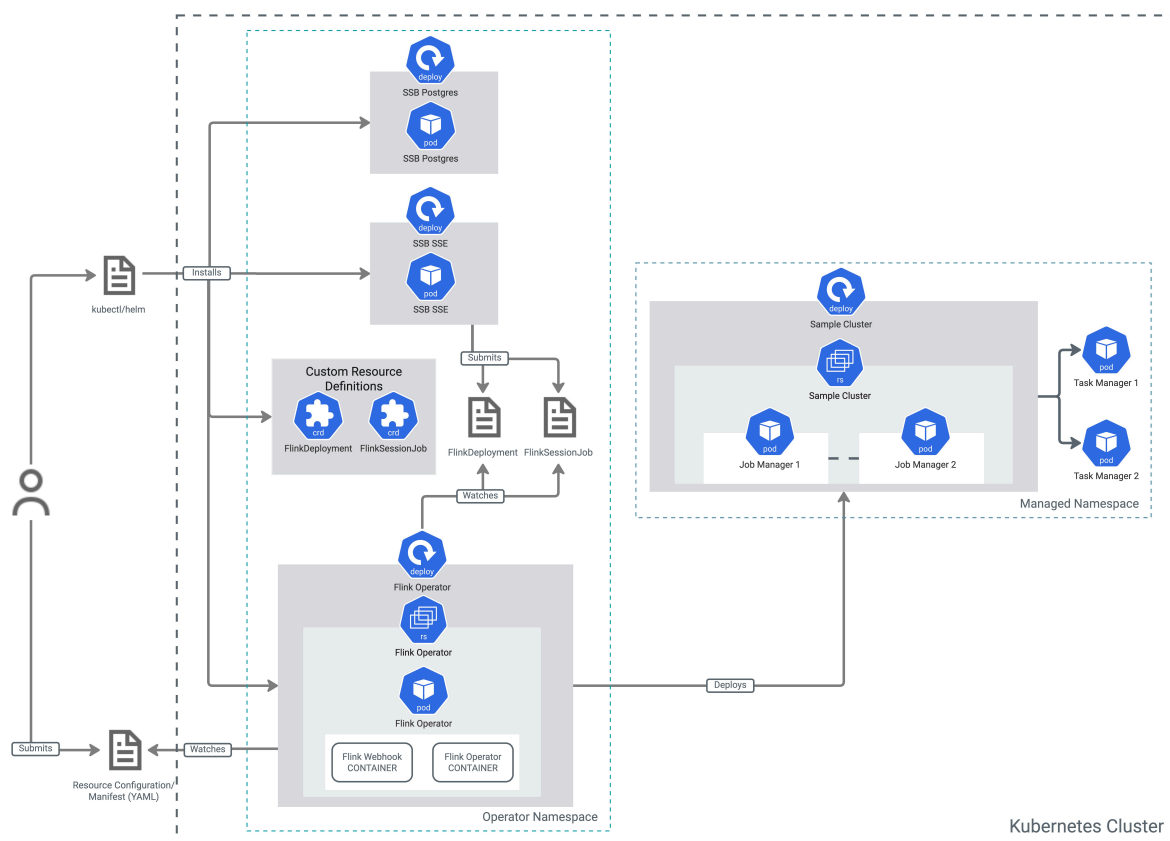
Related Information

[DataStream Operators](#) | [Apache Flink](#)

Deployment architecture

CSA Operator can be installed on a Kubernetes cluster using Helm. The installation of CSA Operator creates the deployment of the Apache Flink Kubernetes Operator (Flink Operator), Flink Webhook, and registers the Custom Resource Definitions (CRDs) on the Kubernetes cluster. As an extension, built on top of the Flink Operator, CSA Operator also deploys the SQL Stream Builder (SSB) engine (in Technical Preview) and its corresponding PostgreSQL database.

The Flink Operator is deployed in a designated namespace. After installation, the Flink Deployment CRD is registered, responsible for bringing up the Flink cluster. Flink deployments are controlled in one or more managed namespaces by the Flink Operator. When you deploy a new Flink deployment, the JobManager pod is created alongside with different Configmaps for the Flink Operator to function. Submitting a Flink deployment with a Flink job will deploy the required TaskManagers for the job to start. The following diagram shows the deployment architecture of the Flink Operator:



When installing the CSA Operator with Helm, the Flink Operator Webhook is also installed as a custom admission plugin, which allows dynamic admission control. Similarly to connectors, you can use it to add plugins to the Flink operator that add custom rules triggered by certain actions.

There are two types of webhooks:

- mutating webhook: if you want to automatically configure some values on it or even force certain config values whenever a user creates a new `FlinkDeployment`, you can create a `FlinkResourceMutator`. Whenever a new `FlinkDeployment` is submitted, Kubernetes will call the webhook of the operator, and apply the custom mutator on the deployment.
- validating webhook: with this type, you cannot apply any changes to the deployment, but can automatically reject the creation of the deployment by implementing custom rules via the webhook.

The Flink Operator Webhook uses the TLS protocol to communicate by default, and automatically loads/reloads the keystore file when the file changes.

SSB integration - [Technical Preview]

CSA Operator comes with seamless SQL Stream Builder (SSB) integration. SSB is built on top of the Flink Operator, offering an interactive user interface for creating streaming SQL jobs.

SSB is a comprehensive interactive user interface for creating stateful stream processing jobs using SQL. Using SQL, you can simply and easily declare expressions that filter, aggregate, route, and otherwise mutate streams of data. SSB offers a job management interface that you can use to compose and run SQL on streams, as well as to create durable data APIs for the results.

The Helm chart contains the SSB subchart, which has two deployments in the CSA Operator: `sse`, which provides the SSB engine and User Interface (UI), and `postgres`, which provides the default database for SSB to function. When submitting a SQL job using the SSB UI (Streaming SQL Console), the parsed SQL is serialized, compressed and encrypted into an environment and a Flink job is deployed. This means that, under the hood, SSB creates the

same Flink Deployment as you would for a generic Flink job, with the only difference that a special Flink job is created for the SQL Runner. The SQL Runner decrypts and decompresses the parsed SQL, sets up the environment inside the Flink job, and executes it. SSB by default deploys the jobs in Session Mode. You can use the installed connectors in your SQL jobs as a source or sink with the supported data formats.

Related Information

[Architecture](#) | [Apache Flink Kubernetes Operator](#)

Licensing

CSA Operator requires a valid license to function. Licenses are made available for you, together with your Cloudera credentials, as part of your license and subscription agreement with Cloudera.

Licenses are registered during CSA Operator installation. They are stored in a Kubernetes secret. Licenses can be updated at any time.

Licenses are valid for a set period of time. Once the license expires, the cluster resources you deployed will continue to run, but reconciliation of resources will be blocked. For example: failed pods will not be restarted and scaling your clusters will not be possible. In general, the control mechanisms in place that keep resources healthy will be blocked. This will result in deployed resources breaking down over time.

CSA Operator publishes various log entries and Kubernetes events related to your licenses.

For example, if your license expires or becomes invalid for any reason, relevant logs and events published will notify you that there are issues with your license.

These logs and events are published for the Flink Operator deployment. You can check these logs and events with the following commands:

```
kubectl events deployments/csa-operator --namespace [***NAMESPACE***]
```

```
kubectl logs deployment/csa-operator --namespace [***NAMESPACE***]
```

Related Information

[Updating Cloudera license](#)