Don’t Miss the Bus – Splunking Kafka at Scale

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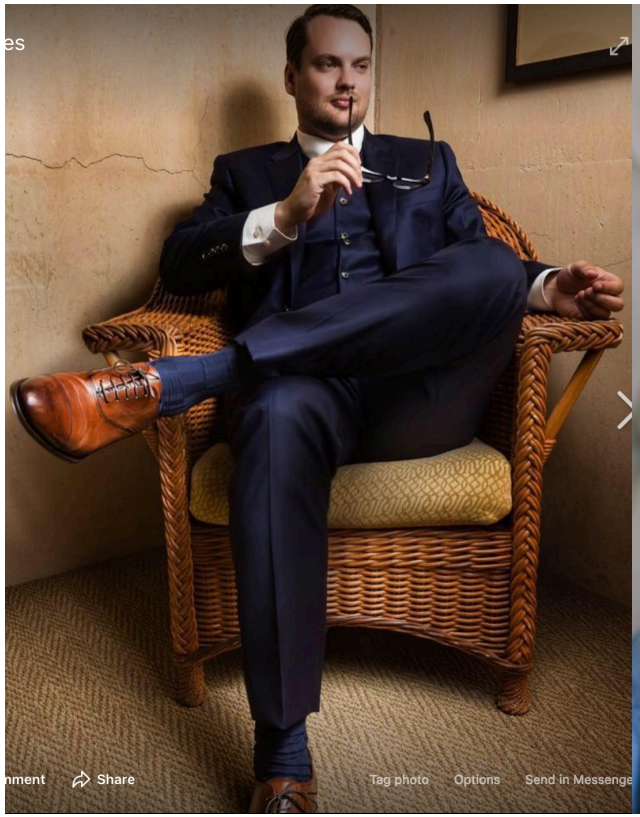
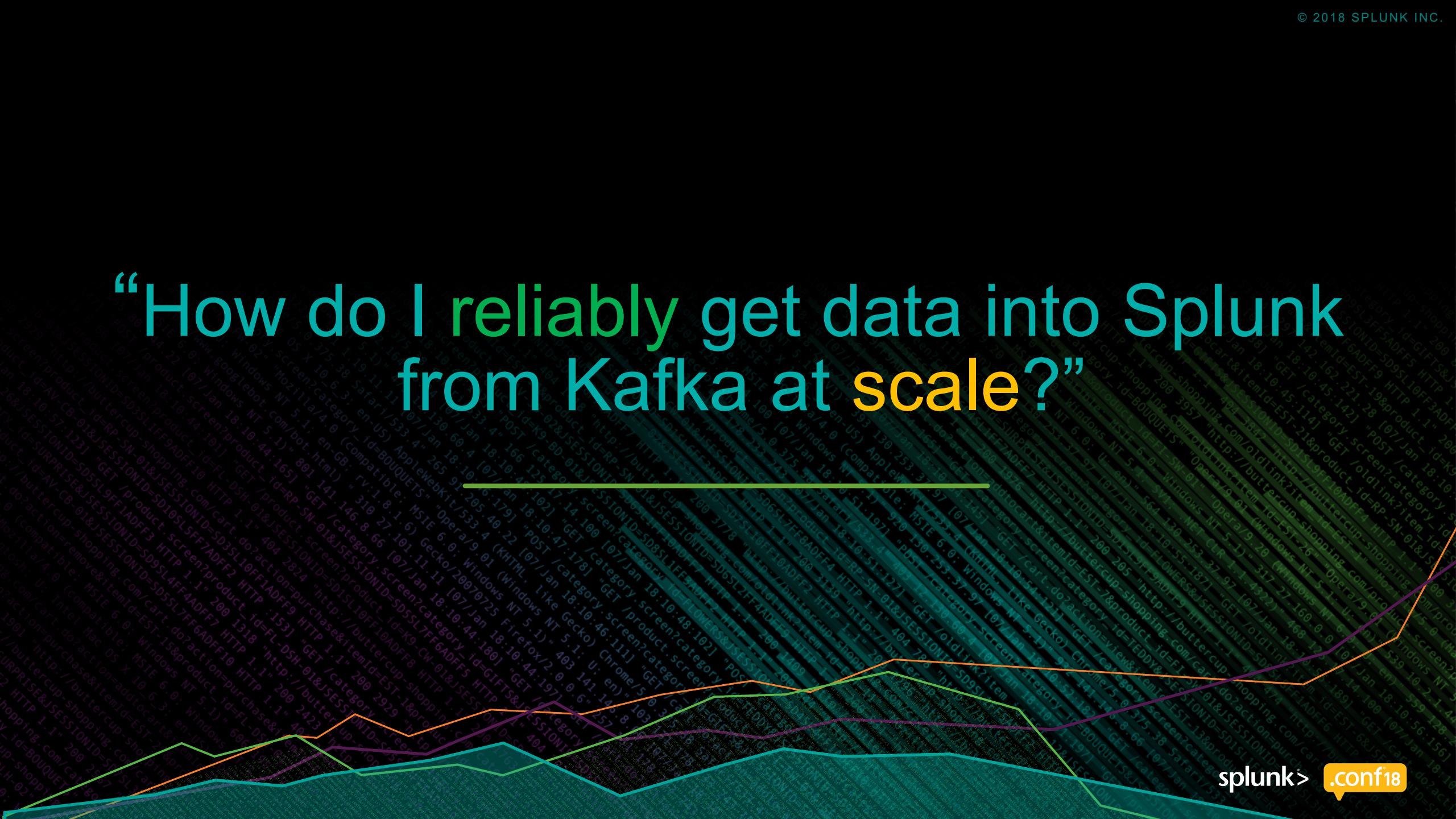
About Us



Agenda

1. Problem Statement / History Lesson
2. Kafka Connect Framework
3. Connector Deployment
4. Configuration & Tuning
5. Data Onboarding
6. Lessons Learned (Gotchas)
7. What's New!

“How do I reliably get data into Splunk from Kafka at scale?”



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Splunk Add-On for Kafka

https://www.splunk.com/blog/2016/10/31/splunking-kafka-at-scale.html

Lacks Scale

Painful Config

Poll Based

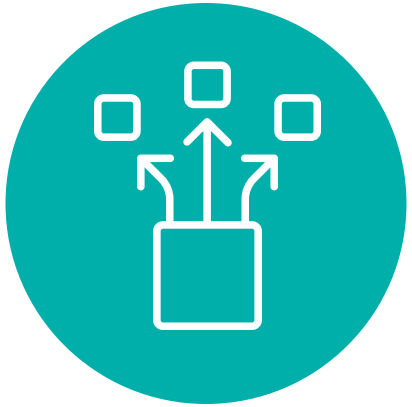
No Fault Tolerance

Pre-Bulit Panels

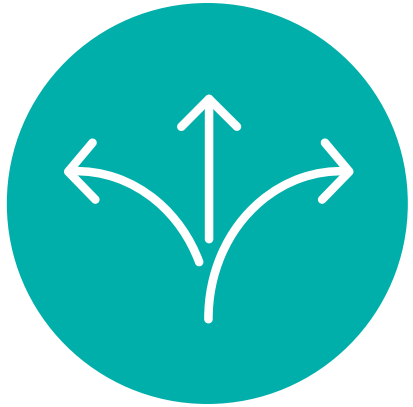
Splunk Connect for Kafka

Scalable

Configuration REST API



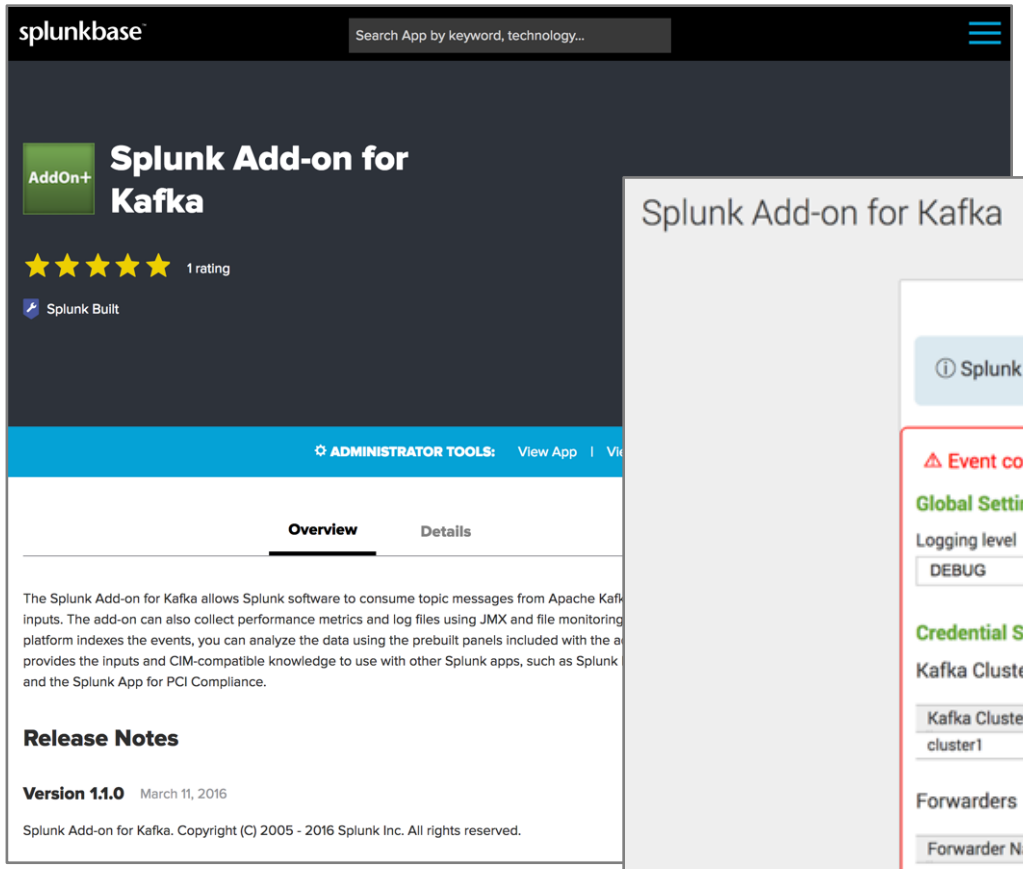
Push To HTTP Event Collector

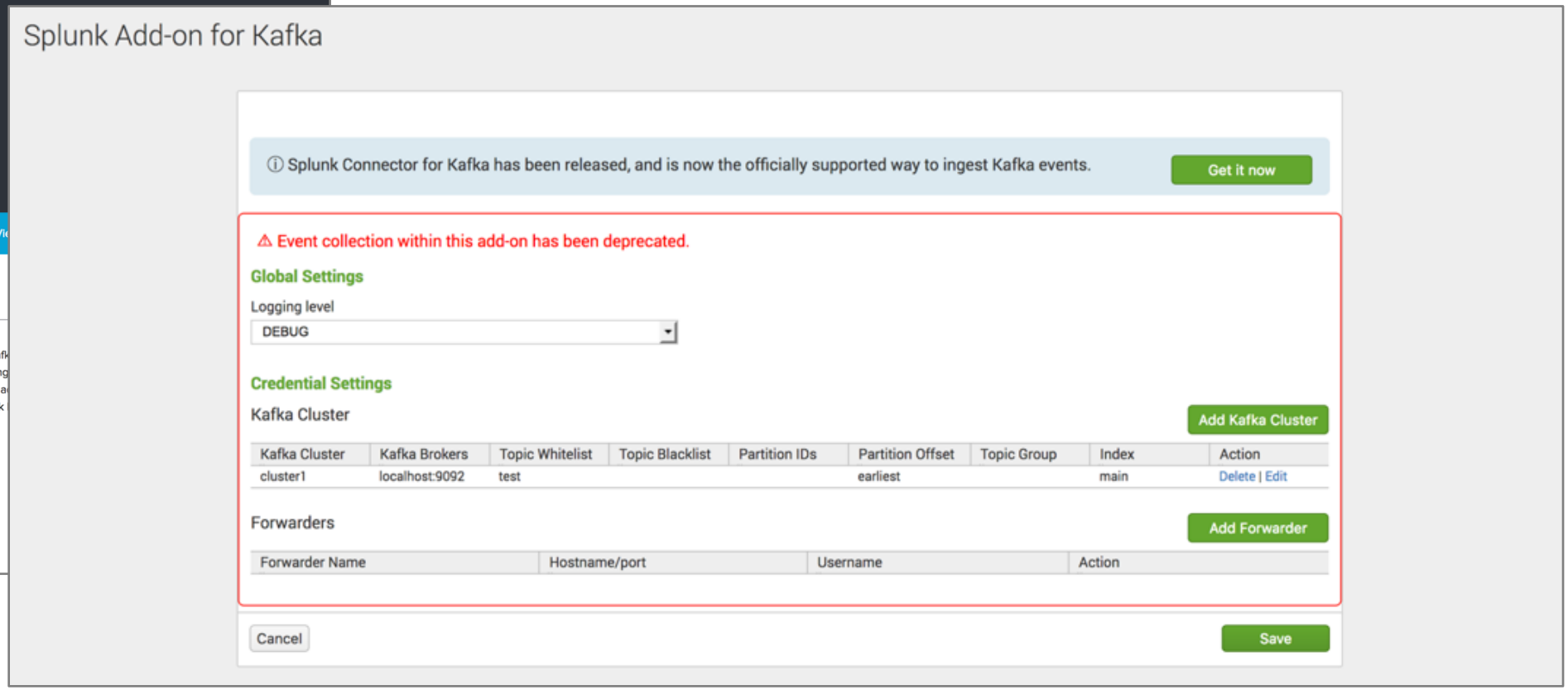


Flexible Data Onboarding

Splunk Supported

Legacy Splunk Add-on for Kafka





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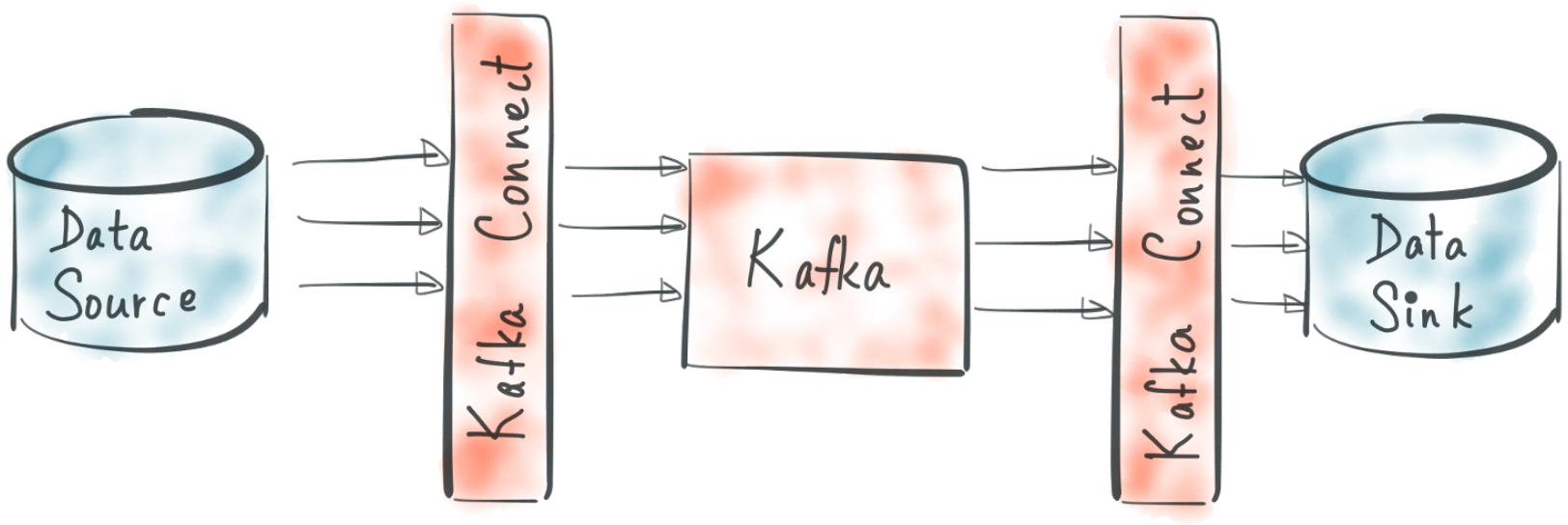
Kafka Connect Framework

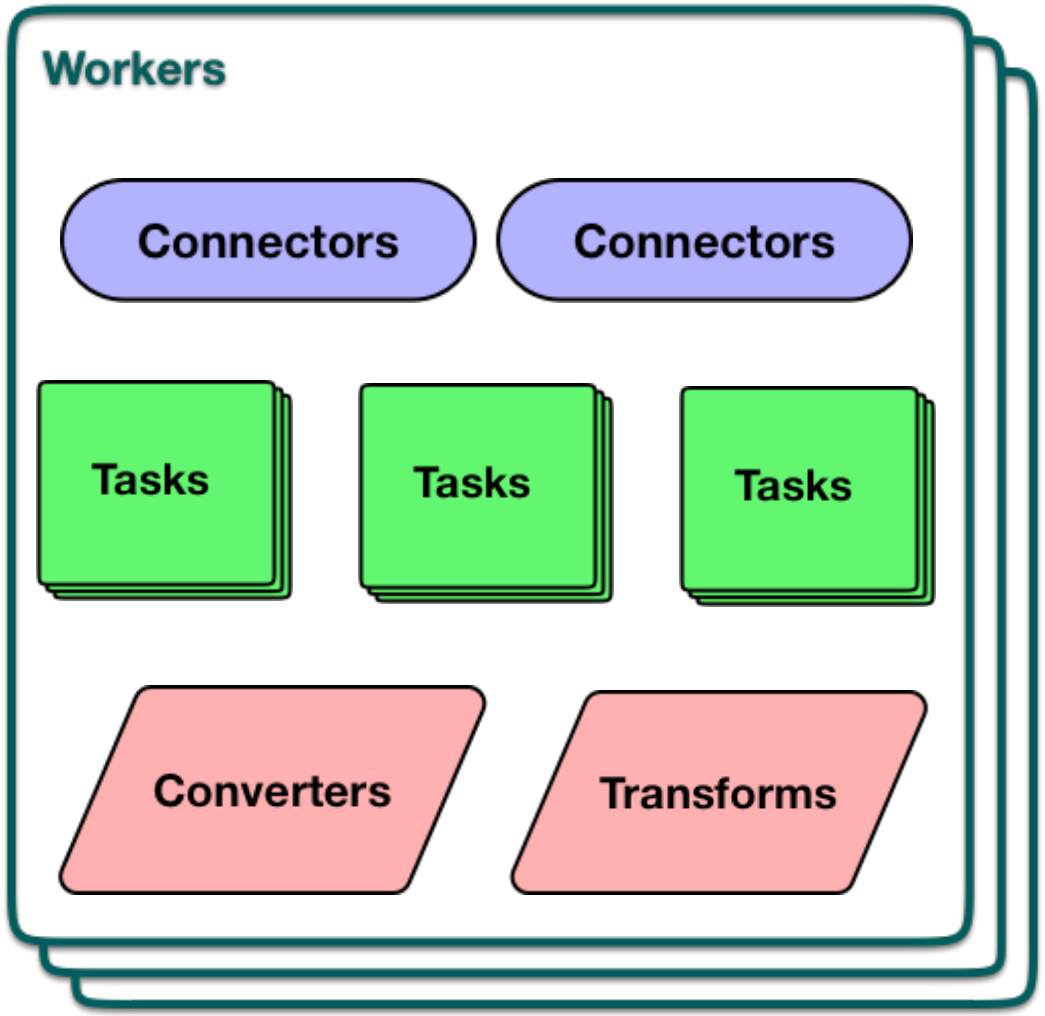
Kafka Connect



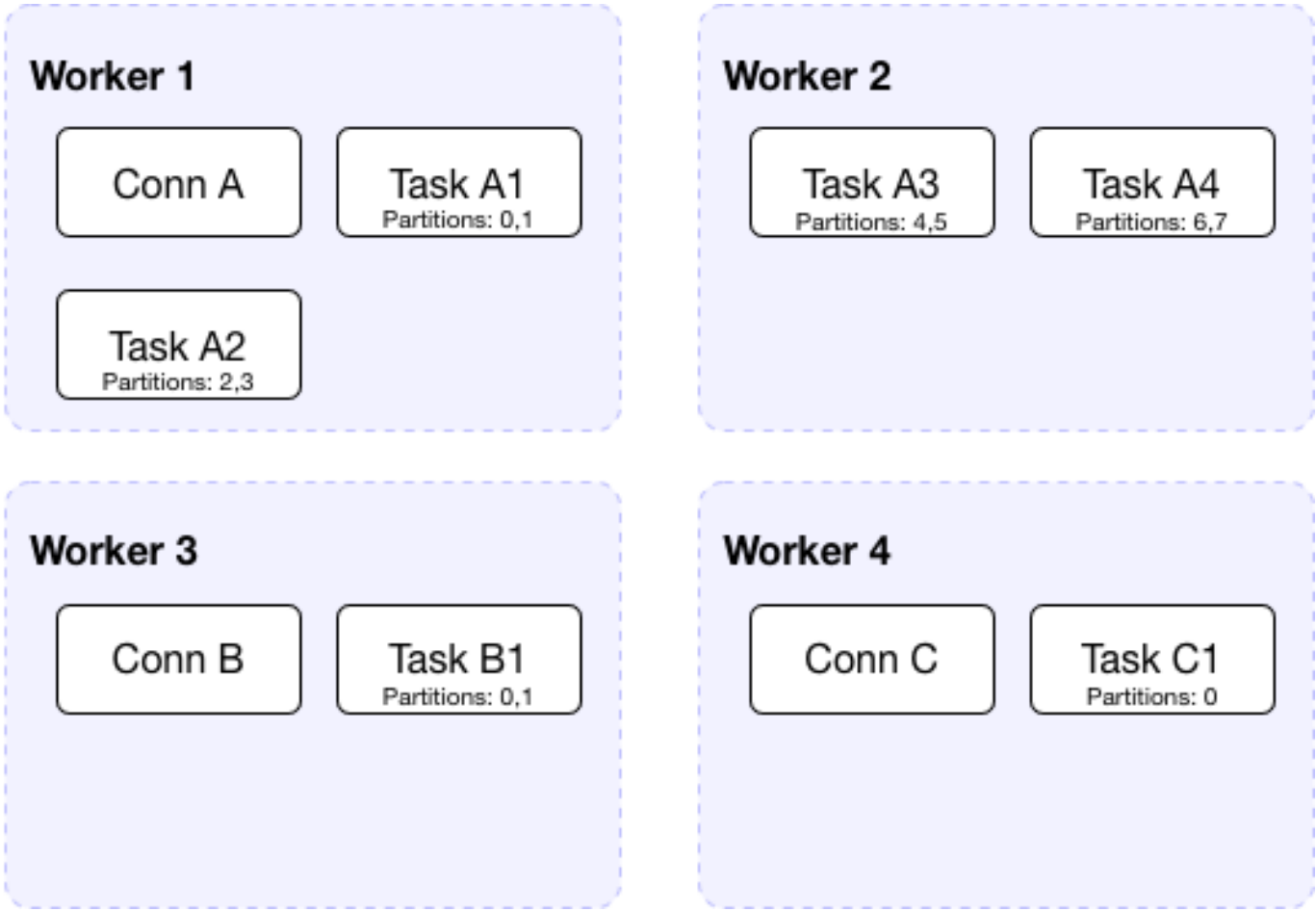
- Ships with Kafka
- Scalable & Reliable Data Streaming
- Auto offset management
- Flexible Deployment
- Source & Sink Connectors
- Streaming & Batch
- REST Interface

Source: Confluent.io

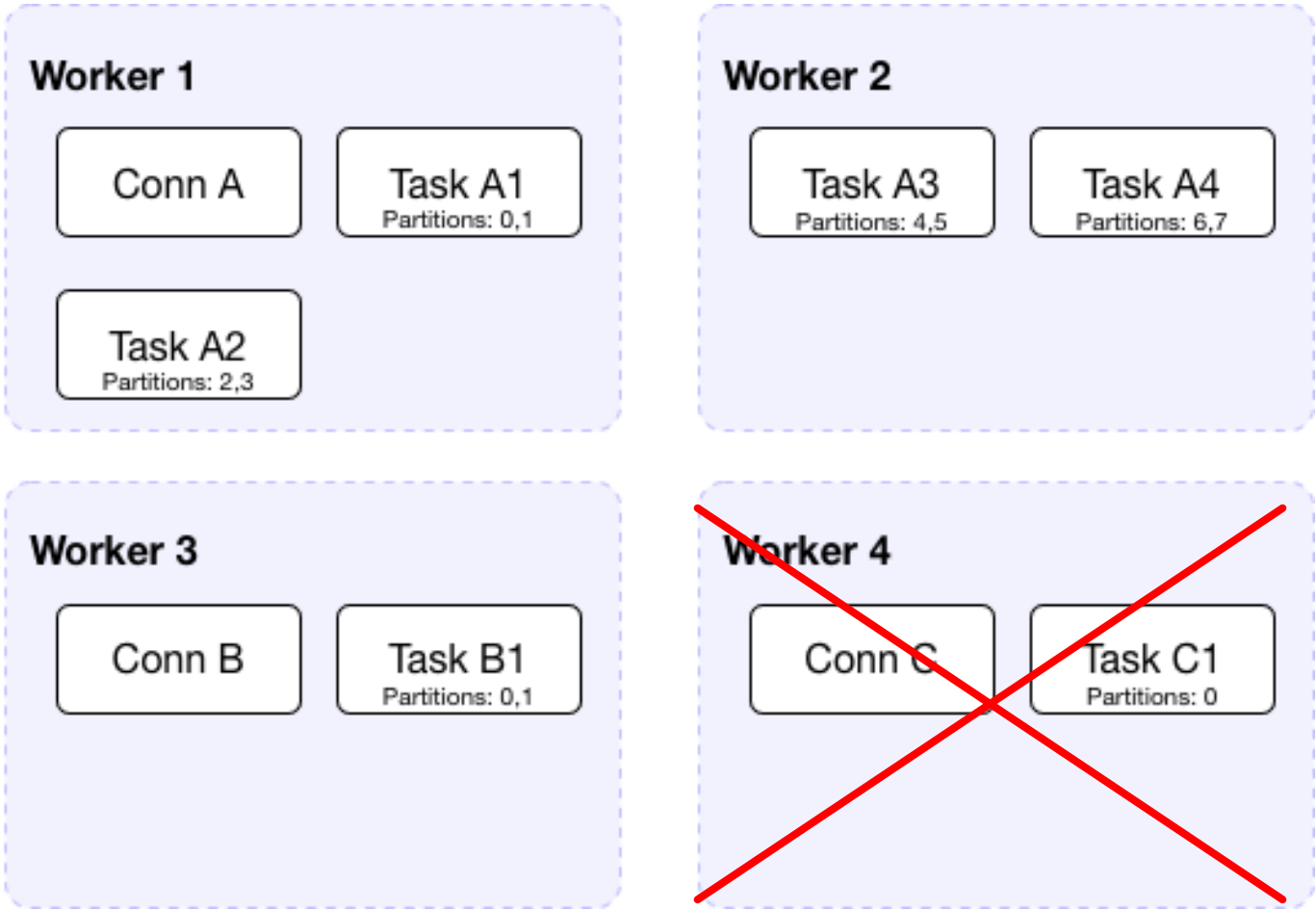
Kafka Connect Concepts



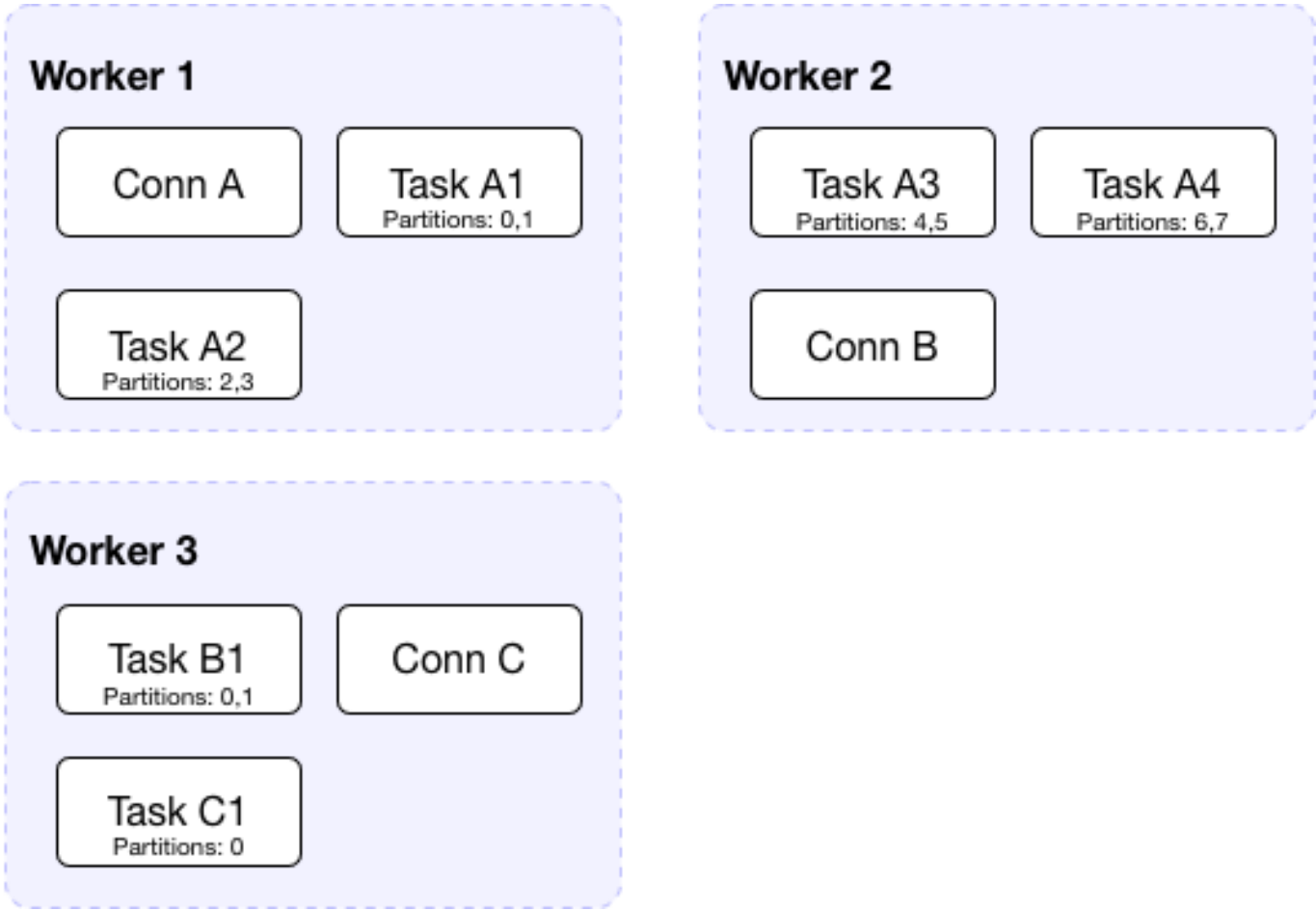
Distributed Execution Model



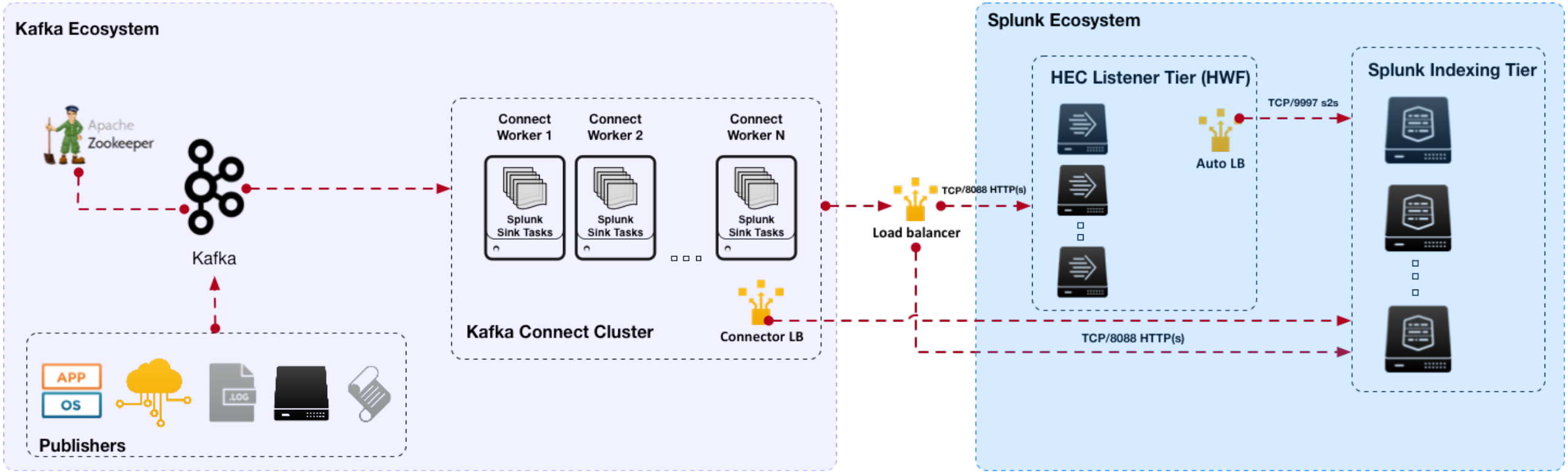
Distributed Execution Model



Distributed Execution Model



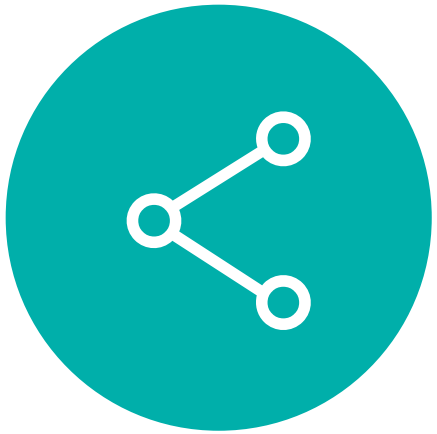
Architecture



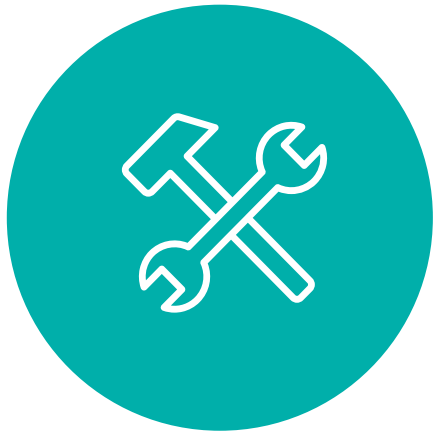
Deployment

Deployment Considerations

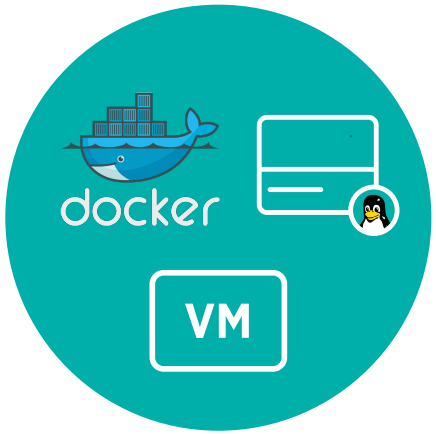
Don’t Co-Mingle With Splunk



Direct Access to Kafka Brokers

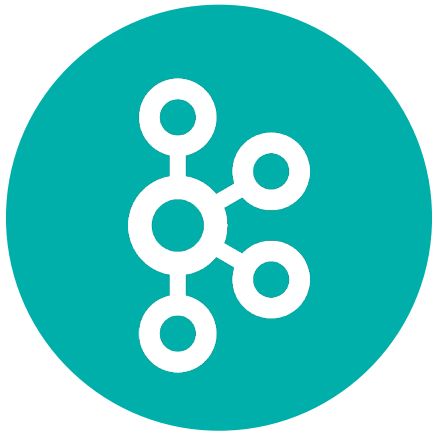


Deploy Centrally or Manage Yourself



Physical, Virtual or Containers

Pre-Requisites



Kafka 0.11.0+

Java 1.8+

Splunk 6.5+

HEC Enabled with Valid token(s)

Quick Start

Apache Kafka with KAFKA_HOME=/opt/kafka

1. Download from Splunkbase - https://splunkbase.splunk.com/app/3862/

2. On **all** Connect instances create plugin directory and copy plugin

```
# mkdir $KAFKA_HOME/plugins/splunk-connect
# cp splunk-kafka-connect-<version>.jar $KAFKA_HOME/plugins/splunk-connect
```

Quick Start (Cont..)

3. Edit $KAFKA_HOME/config/connect-distributed.properties

```
# These settings may already be configured if you have deployed
# a connector in your Kafka Connect Environment
bootstrap.servers=broker1:9092,broker2:9092
plugin.path=/opt/kafka/plugins

#Required configurations for Splunk Connect for Kafka
key.converter=org.apache.kafka.connect.storage.StringConverter
value.converter=org.apache.kafka.connect.storage.StringConverter
key.converter.schemas.enable=false
value.converter.schemas.enable=false
internal.key.converter=org.apache.kafka.connect.json.JsonConverter
internal.value.converter=org.apache.kafka.connect.json.JsonConverter
internal.key.converter.schemas.enable=false
internal.value.converter.schemas.enable=false
offset.flush.interval.ms=10000

#Recommended configurations for Splunk Connect for Kafka
group.id=kafka-connect-splunk-hec-sink
```

Quick Start (Cont..)

```
# Topic to use for storing offsets. This topic should have many partitions and be replicated and compacted.
offset.storage.topic=connect-offsets
offset.storage.replication.factor=1
#offset.storage.partitions=25

# Topic to use for storing connector and task configurations; note that this should be a single partition,
# highly replicated, and compacted topic.
config.storage.topic=connect-configs
config.storage.replication.factor=1

# Topic to use for storing statuses. This topic can have multiple partitions and should be replicated
# and compacted.
status.storage.topic=connect-status
status.storage.replication.factor=1
#status.storage.partitions=5
```

Quick Start (Cont..)

4. Start Kafka Connect

```
# $KAFKA_HOME/bin/connect-distributed.sh $KAFKA_HOME/config/connect-distributed.properties
```

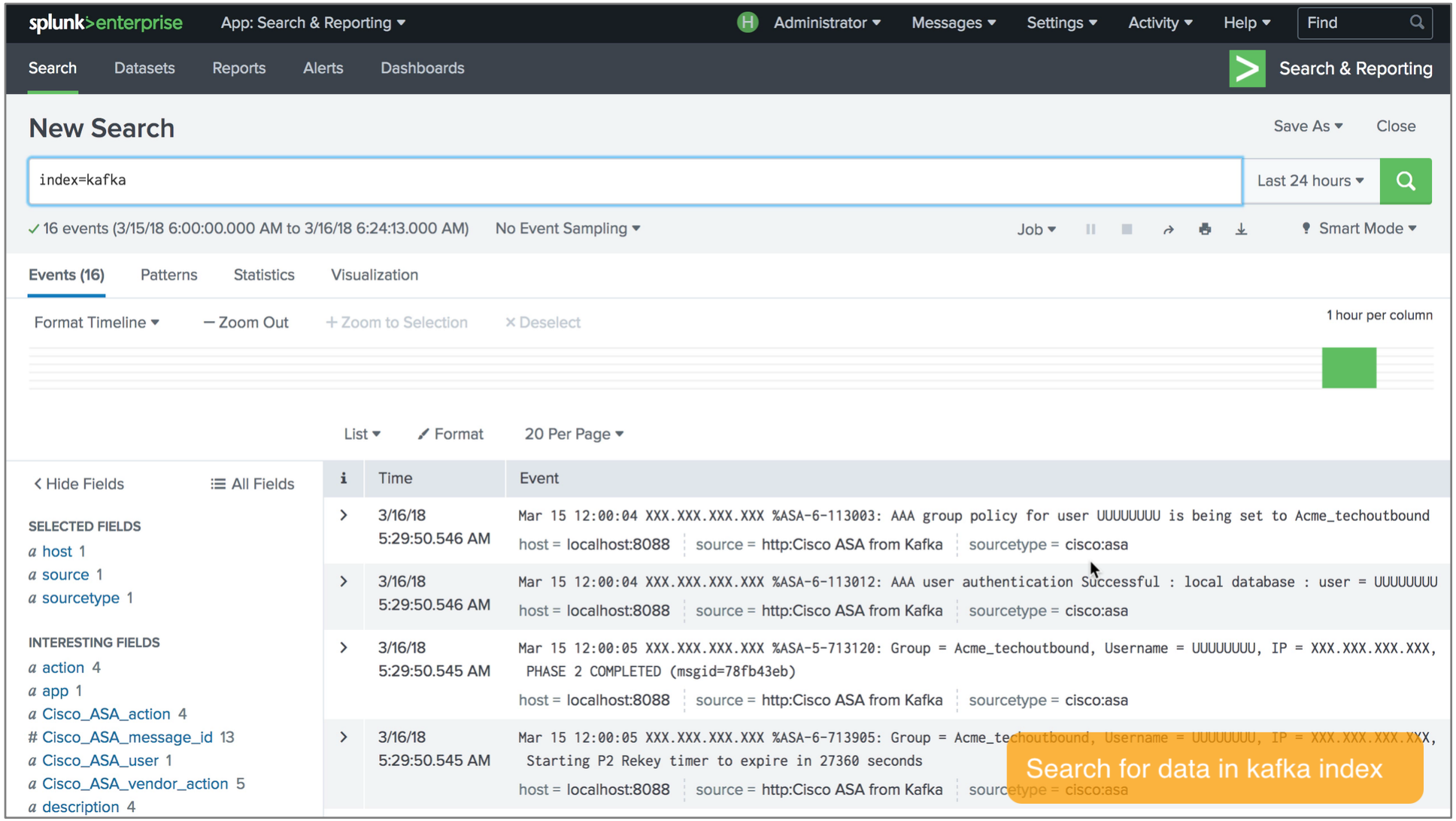
5. Verify connector

```
# curl http://<KAFKA_CONNECT_HOST>:8083/connector-plugins
{"class":"com.splunk.kafka.connect.SplunkSinkConnector","type":"sink","version":"v1.0.0”}
```

Create Connector

```
$ curl localhost:8083/connectors -X POST -H "Content-Type: application/json" -d '{
 "name": "CiscoToSplunk",
 "config": {
  "connector.class": "com.splunk.kafka.connect.SplunkSinkConnector",
  "tasks.max": "1",
  "topics":"cisco_asa",
  "splunk.hec.uri": "https://localhost:8088",
  "splunk.hec.token": "9948d956-b83e-48f8-811c-f332f0082d47",
  "splunk.hec.ack.enabled": "false",
  "splunk.hec.ssl.validate.certs": "false"
 }
}'
```

Search for Data in Splunk



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Kafka Connect REST API

Base URI – http://connect-worker:8083

`GET /connector-plugins/` - list installed connector plugins in cluster

`GET /connectors` - list active connectors

`POST /connectors` - create new connector

`GET /connectors/(string: name)` - get info about connector

`GET /connectors/(string: name)/config` - get connector config

`GET /connectors/(string: name)/status` - get connector status

`POST /connectors/(string: name)/restart` - restart connector

`PUT /connectors/(string: name)/pause` - pause connector and tasks

`PUT /connectors/(string: name)/resume` - resume paused connector

`DELETE /connectors/(string: name)/` - delete connector, halting all tasks and delete config

Kafka Connect REST API

`GET /connectors/(string: name)/tasks` - list running tasks for connector

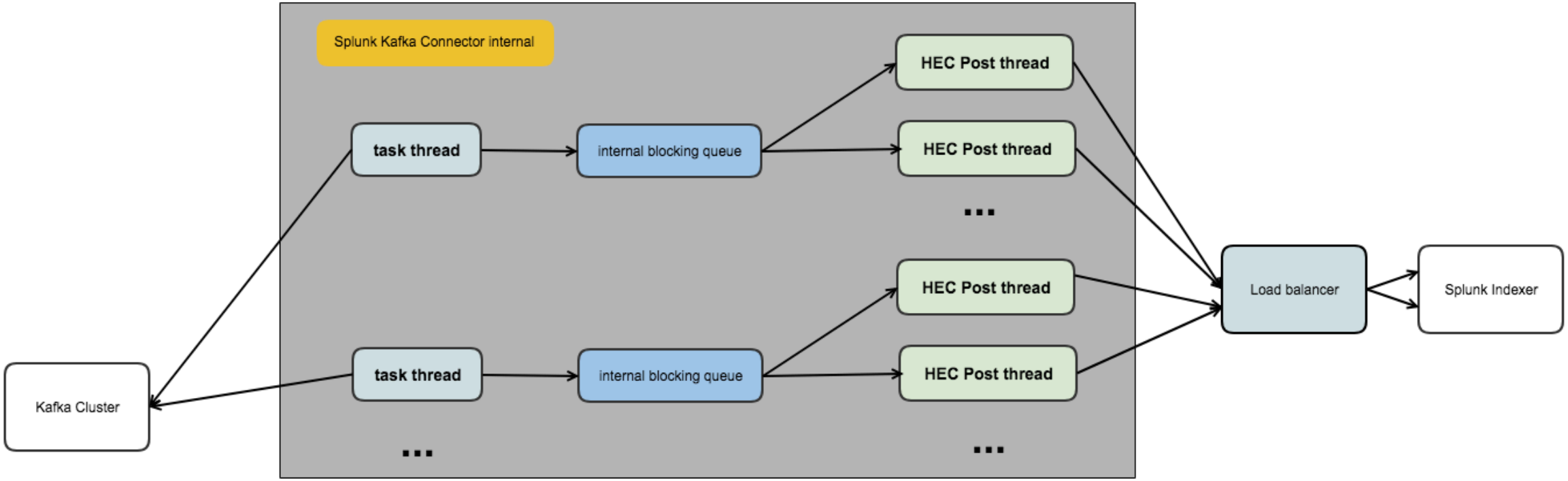
`GET /connectors/(string: name)/tasks/(int: taskid)/status` - get task's status

`POST /connectors/(string: name)/tasks/(int: taskid)/restart` - restart individual task

Configuration & Tuning

Key Components

Splunk Kafka Connect Internals



Kafka Consumer Options

- Kafka consumer options (connect-distributed.properties)
  - consumer.max.poll.records
  - consumer.max.poll.interval
  - consumer.fetch.min.bytes
  - consumer.fetch.max.bytes
  - consumer.max.partition.fetch.bytes
  - consumer.receive.buffer.bytes

```
# Set to a list of filesystem paths separated by commas (,) to enable class loading isolation for plu
# (connectors, converters, transformations). The list should consist of top level directories that in
# any combination of:
# a) directories immediately containing jars with plugins and their dependencies
# b) uber-jars with plugins and their dependencies
# c) directories immediately containing the package directory structure of classes of plugins and the
# Examples:
# plugin.path=/usr/local/share/java,/usr/local/share/kafka/plugins,/opt/connectors,
plugin.path=/Users/dtregonning/Development/kafka/kafka_2.0/connectors

consumer.max.poll.records=500
consumer.max.poll.interval=1000
consumer.fetch.min.bytes=500
consumer.fetch.max.bytes=500
consumer.max.partition.fetch.bytes=500
consumer.receive.buffer.bytes=500
```

Kafka Connect Options

Scale up

- Number of concurrent Tasks
  - Adjust the concurrency according to number of topic partitions and your hardware resources
  - Possible to overload a Splunk environment with too many tasks
- HEC batch size
  - Events are either flushed after a certain time or batched
- HTTP keepalive

Scale out

- Adding more “worker” nodes to Kafka Connect Cluster
  - When seeing consumer group “lag”

Http Event Collector(HEC) Tuning Options

Scale up

- dedicatedIoThreads = <number> (inputs.conf)
  - ~ number of cores
- parallelIngestionPipelines = <number> (servers.conf)
  - ~ 2 (can increase even larger if there are lots of CPU resources)

Scale out

- Add more HEC nodes
  - When seeing HTTP 503 server busy error
  - When seeing the processing pipeline full

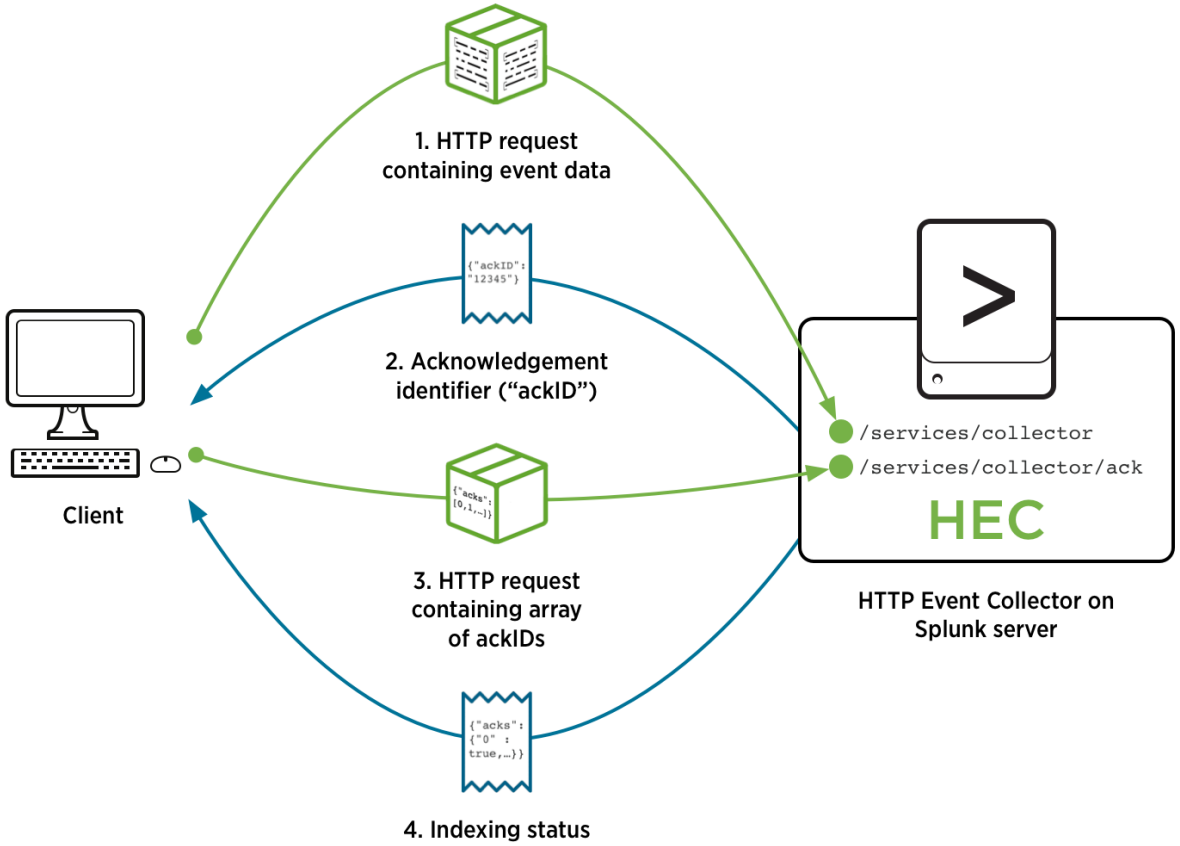
JVM Tuning Options

- KAFKA_HEAP_OPTS="-Xmx16G –Xms8G”

```
[2018-09-07 13:50:52,041] ERROR WorkerSinkTask{id=kafka-connect-splunk-0} Task threw an uncaught and unrecoverable exception (org.apache.kafka.connect.runtime.WorkerTask:177)
java.lang.OutOfMemoryError: Java heap space
        at java.util.Arrays.copyOfRange(Arrays.java:3664)
        at java.lang.String.<init>(String.java:207)
        at java.io.BufferedReader.readLine(BufferedReader.java:356)
        at java.io.BufferedReader.readLine(BufferedReader.java:389)
        at org.apache.http.conn.util.PublicSuffixListParser.parseByType(PublicSuffixListParser.java:111)
        at org.apache.http.conn.util.PublicSuffixMatcherLoader.load(PublicSuffixMatcherLoader.java:54)
        at org.apache.http.conn.util.PublicSuffixMatcherLoader.load(PublicSuffixMatcherLoader.java:63)
        at org.apache.http.conn.util.PublicSuffixMatcherLoader.getDefault(PublicSuffixMatcherLoader.java:89)
        at org.apache.http.impl.client.HttpClientBuilder.build(HttpClientBuilder.java:936)
        at com.splunk.hecclient.HttpClientBuilder.build(HttpClientBuilder.java:87)
        at com.splunk.hecclient.Hec.createHttpClient(Hec.java:275)
        at com.splunk.hecclient.Hec.newHecWithAck(Hec.java:75)
        at com.splunk.kafka.connect.SplunkSinkTask.createHec(SplunkSinkTask.java:425)
        at com.splunk.kafka.connect.SplunkSinkTask.start(SplunkSinkTask.java:47)
        at org.apache.kafka.connect.runtime.WorkerSinkTask.initializeAndStart(WorkerSinkTask.java:301)
        at org.apache.kafka.connect.runtime.WorkerSinkTask.execute(WorkerSinkTask.java:190)
        at org.apache.kafka.connect.runtime.WorkerTask.doRun(WorkerTask.java:175)
        at org.apache.kafka.connect.runtime.WorkerTask.run(WorkerTask.java:219)
        at java.util.concurrent.Executors$RunnableAdapter.call(Executors.java:511)
        at java.util.concurrent.FutureTask.run(FutureTask.java:266)
        at java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoolExecutor.java:1149)
        at java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPoolExecutor.java:624)
        at java.lang.Thread.run(Thread.java:748)
```

Data Onboarding

Indexer Acknowledgement



- Splunk guarantees "at least once" delivery semantics
- Kafka ACK Options
  - splunk.hec.ack.enabled
  - splunk.hec.ack.poll.interval
  - splunk.hec.ack.poll.threads
  - splunk.hec.event.timeout
- Using Acknowledgement may increase Splunk Connector memory usage

Load Balancing

- Connector supports hardware and software Load Balancing
- Sticky Sessions must be enabled for Indexer ACK
- Set Sticky Session timeout value to highest value available
- Duplicates may be a side-effect on session expiry
- Load Balancing Options
  - splunk.hec.total.channels
  - Set HEC channels (**splunk.hec.total.channels**) to multiple HEC endpoints (= indexers or 2 * indexers behind the load balancer)

Onboarding Data with HEC Raw and Event Endpoint

- Version 1.0 behavior (global)
- Version 1.1 behavior (event based)
- Raw endpoint *(services/collector/raw)*
  - props.conf and transforms.conf
  - Use **splunk.hec.raw.line.breaker** to inject string to be used by Splunk to break events

```
[s1] # sourcetype name
LINE_BREAKER = (####)
SHOULD_LINEMERGE = false
```

- Event endpoint *(services/collector/event)*
  - **splunk.hec.json.event.enrichment** is used to add extra fields to All Kafka Records(Global)
  - Enabling **splunk.hec.track.data** will send through some Kafka specific data (topics, partitions, offsets)
  - Good for investigating “data loss” and “data duplication”
  - Records already in the Splunk HEC JSON format… use **splunk.hec.json.event.formatted**

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What are Kafka Headers?

- Disabled by default
  - splunk.header.support = true
- Facilitates per-event routing
- Ability to map Kafka metadata to be used as Splunk metadata
  - (host, source, sourcetype, index, custom fields)
- Support added for both HEC /event and /raw

Headers (Cont..)

- Kafka Headers contain extra metadata associated with Kafka Records.
- Version 1.1 of connector includes new parameters
  - "**splunk.header.support**" – Used to enable Header support
  - "**splunk.header.custom**" – Used to add custom made headers to a Splunk event
  - "**splunk.header.index**" – Used to set a Kafka Headers value as the destination index in Spunk
  - "**splunk.header.source**" –Used to set a Kafka Headers value as the source in Spunk
  - "**splunk.header.sourcetype**" – Used to set a Kafka Headers value as the sourcetype in Spunk
  - "**splunk.header.host**" – Used to set a Kafka Headers value as the host in Spunk

Headers Example (Cont..)

REST Example to deploy connector with Header support

```
curl localhost:8083/connectors -X POST -H "Content-Type: application/json" -d'{
  "name": "splunk-kafka-connect",
    "config": {
      "connector.class": "com.splunk.kafka.connect.SplunkSinkConnector",
      "tasks.max": "1",
      "topics": "kafka-demo-header-raw-3",
      "splunk.hec.uri": "http://localhost:8222",
      "splunk.hec.ack.enabled": "false",
      "splunk.hec.raw" : "false",
      "splunk.hec.token": "b87c2ba3-84b2-4de9-8777-453ab6ccd864",
      "splunk.header.support": "true",
      "splunk.header.index" : "destination_storage",
      "splunk.header.source" : "Financial_Processing_Application",
      "splunk.header.sourcetype" : "ledger_format_1",
      "splunk.header.host": "finance.company.host"
    }
}'
```

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What's new for Splunk Connect for Kafka

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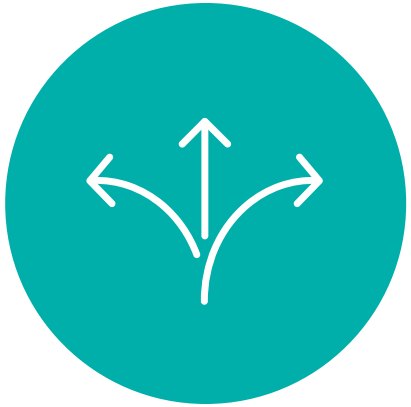
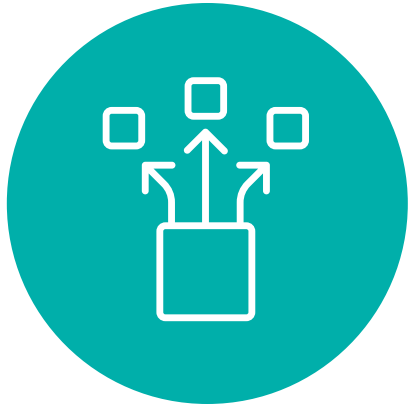
Splunk Connect for Kafka Version 1.1

Structed Data (Avro, JSON)



Per-Event Routing / Metadata Override with Kafka Headers

HEC Event Format



Sticky Session Improvements

Custom Java Keystore Location

Lessons Learned (Gotchas)

Some gotchas we've seen on our adventures

- Match Kafka Connect version to Broker Version. Use Compatibility Matrix!
- Auto-topic creation is default behavior, you may have to create them manually
- Too many partitions and tasks can overwhelm HEC
  - Start small and scale out
- Heap Size for high throughput systems
- Double check connector jar md5sum against GitHub

Don't forget to rate this session
in the .conf18 mobile app