

Hortonworks Data Platform

Apache Flume Component Guide

(August 31, 2017)

Hortonworks Data Platform: Apache Flume Component Guide

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1.1. Features by HDP Version 1

1. Feature Changes

Apache Flume version 1.5.2 includes cumulative 1.6 features and selected 1.7 features. The table below indicates the features added to Flume 1.5.2 with each release of Hortonworks Data Platform (HDP).

Content related to the Flume 1.7 features has been added to the Flume 1.5.2 User Guide and Developer Guide.



Note

As of HDP 2.6.0, Flume is deprecated but still supported. It will be removed and no longer supported as of HDP 3.0.0.

Table 1.1. Features by HDP Version

| HDP Release | Added Features | Advantages |
|-------------|---|---|
| 2.6.2 | Flume-Kafka Source with new Consumer (FLUME-2821) | Provides support for new Kafka Consumer API, including reading multiple Kafka topics. |
| | Flume-Kafka-Sink with new Producer (FLUME-2822) | Provides support for new Kafka Producer API. |
| | Kafka Source/Sink should optionally read/write Flume records (FLUME-2852) | Preserve event headers when using Kafka Sink and Kafka Source together. Avro Datums can be read from and written to Kafka. |
| | Make raw data appearing in log messages explicit (FLUME-2954) | Adds two system properties, one to enable logging of Flume configuration properties and one to enable logging of raw data. Helps determine whether or not logging potentially sensitive information is allowed. |
| | Handle offset migration in the new Kafka Channel (FLUME-2972) | If Kafka offsets do not exist and migration is enabled, the offsets are copied from ZooKeeper to Kafka. Also addresses the backwards incompatibility issue with the zookeeperConnect property. |
| | Handle offset migration in the new Kafka Source (FLUME-2983) | If Kafka offsets do not exist and migration is enabled, the offsets are copied from ZooKeeper to Kafka. Also addresses the backwards incompatibility issue with the zookeeperConnect property. |
| | Bug fixes | FLUME-2915, FLUME-2920, FLUME-2963 |
| 2.5.0 | Kafka Channel | Uses a single Kafka topic. Provides greater reliability and better performance. |
| | TailDir Source | Greater data reliability, even with rotating file names. Can restart tailing at the point where Flume stopped, while continuing data ingest. |
| 2.4.0 | Kafka Source | Reads messages from a Kafka topic. Can have multiple Kafka sources running and configure them to read a unique set of partitions for the topic. |
| | Kafka Sink | Publishes data to a Kafka topic. Supports pull-based processing from various Flume sources. |
| 2.3.0 | Hive Sink | Not recommended for use in production. Streams events containing delimited text or JSON data directly into a Hive table or partition. Provides a preview feature and not. |

2. Introduction

Flume is a top-level project at the Apache Software Foundation. While it can function as a general-purpose event queue manager, in the context of Hadoop it is most often used as a log aggregator, collecting log data from many diverse sources and moving them to a centralized data store.

The following information is available in this chapter:

- [Section 2.1, "Flume Concepts" \[2\]](#)
- [Section 2.2, "HDP and Flume" \[2\]](#)
- [Section 2.3, "A Simple Example" \[3\]](#)
- [Section 2.4, "Flume 1.5.2 Documentation" \[4\]](#)

2.1. Flume Concepts

Flume Components

A Flume data flow is made up of five main components: Events, Sources, Channels, Sinks, and Agents:

Events An event is the basic unit of data that is moved using Flume. It is similar to a message in JMS and is generally small. It is made up of headers and a byte-array body.

Sources The source receives the event from some external entity and stores it in a channel. The source must understand the type of event that is sent to it: an Avro event requires an Avro source.

Channels A channel is an internal passive store with certain specific characteristics. An in-memory channel, for example, can move events very quickly, but does not provide persistence. A file-based channel provides persistence. A source stores an event in the channel where it stays until it is consumed by a sink. This temporary storage lets source and sink run asynchronously.

Sinks The sink removes the event from the channel and forwards it to either to a destination, like HDFS, or to another agent/dataflow. The sink must output an event that is appropriate to the destination.

Agents An agent is the container for a Flume data flow. It is any physical JVM running Flume. An agent must contain at least one source, channel, and sink, but the same agent can run multiple sources, sinks, and channels. A particular data flow path is set up through the configuration process.

2.2. HDP and Flume

Flume ships with many source, channel, and sink types. The following types have been thoroughly tested for use with HDP:

Sources

- Exec (basic, restart)
- Syslogtcp
- Syslogudp
- TailDir
- Kafka

Channels

- Memory
- File
- Kafka

Sinks

- HDFS: secure, nonsecure
- HBase
- Kafka
- Hive

See the [Apache Flume 1.5.2 documentation](#) for a complete list of all available Flume components.

2.3. A Simple Example

The following snippet shows some of the kinds of properties that can be set using the properties file. For more detailed information, see the [Apache Flume 1.5.2 documentation](#).

```
agent.sources = pstream
agent.channels = memoryChannel
agent.channels.memoryChannel.type = memory

agent.sources.pstream.channels = memoryChannel
agent.sources.pstream.type = exec
agent.sources.pstream.command = tail -f /etc/passwd

agent.sinks = hdfsSink
agent.sinks.hdfsSink.type = hdfs
agent.sinks.hdfsSink.channel = memoryChannel
agent.sinks.hdfsSink.hdfs.path = hdfs://hdp/user/root/flumetest
agent.sinks.hdfsSink.hdfs.fileType = SequenceFile
agent.sinks.hdfsSink.hdfs.writeFormat = Text
```

The source here is defined as an exec source. The agent runs a given command on startup, which streams data to `stdout`, where the source gets it.

In this case, the command is a Python test script. The channel is defined as an in-memory channel and the sink is an HDFS sink.

2.4. Flume 1.5.2 Documentation

See the complete [Apache Flume 1.5.2 documentation](#) for details about using Flume with Hortonworks Data Platform. The documentation is updated to reflect support for new features.

The Flume 1.5.2 documentation is also included with the Flume software. You can access the documentation in the Flume `/docs` directory.

3. Using Apache Flume for Streaming

Kafka Sink and Hive Sink are integrated with Flume to provide streaming capabilities for Hive tables and Kafka topics. For more information about Flume, see the [Apache Flume 1.5.2 documentation](#).

3.1. Kafka Sink

This is a Flume Sink implementation that can publish data to a Kafka topic. One of the objectives is to integrate Flume with Kafka so that pull-based processing systems can process the data coming through various Flume sources. This currently supports Kafka 0.8.x series of releases.

| Property Name | Default | Description |
|---------------------------------|---------------------|--|
| type | - | Must be set to org.apache.flume.sink.kafka.KafkaSink. |
| brokerList | - | List of brokers Kafka-Sink will connect to, to get the list of topic partitions. This can be a partial list of brokers, but we recommend at least two for HA. The format is a comma separated list of hostname:port. |
| topic | default-flume-topic | The topic in Kafka to which the messages will be published. If this parameter is configured, messages will be published to this topic. If the event header contains a "topic" field, the event will be published to that topic overriding the topic configured here. |
| batchSize | 100 | How many messages to process in one batch. Larger batches improve throughput while adding latency. |
| requiredAcks | 1 | How many replicas must acknowledge a message before it is considered successfully written. Accepted values are 0 (Never wait for acknowledgement), 1 (wait for leader only), -1 (wait for all replicas) Set this to -1 to avoid data loss in some cases of leader failure. |
| Other Kafka Producer Properties | - | These properties are used to configure the Kafka Producer. Any producer property supported by Kafka can be used. The only requirement is to prepend the property name with the prefix "Kafka.". For example kafka.producer.type. |

Kafka Sink uses the topic and key properties from the FlumeEvent headers to send events to Kafka. If the topic exists in the headers, the event is sent to that specific topic, overriding the topic configured for the Sink. If key exists in the headers, the key is used by Kafka to partition the data between the topic partitions. Events with the same key are sent to the same partition. If the key is null, events are sent to random partitions.

An example configuration of a Kafka sink is given below. Properties starting with the prefix Kafka (the last 3 properties) are used when instantiating the Kafka producer.

The properties that are passed when creating the Kafka producer are not limited to the properties given in this example. It is also possible include your custom properties here and access them inside the preprocessor through the Flume Context object passed in as a method argument.

```
al.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink al.sinks.k1.topic =
  mytopic
al.sinks.k1.brokerList = localhost:9092
al.sinks.k1.requiredAcks = 1
al.sinks.k1.batchSize = 20
al.sinks.k1.channel = c1
```

3.2. Hive Sink

This sink streams events containing delimited text or JSON data directly into a Hive table or partition. Events are written using Hive transactions. As soon as a set of events are committed to Hive, they become immediately visible to Hive queries. Partitions to which flume will stream to can either be pre-created or, optionally, Flume can create them if they are missing. Fields from incoming event data are mapped to corresponding columns in the Hive table.

| Property Name | Default | Description |
|-----------------------------|---------|--|
| channel | - | |
| type | - | The component type name, needs to be hive. |
| hive.metastore | - | Hive metastore URI (e.g. thrift://a.b.com:9083). |
| hive.database | - | Hive database name |
| hive.table | - | Hive table name. |
| hive.partition | - | Comma separated list of partition values identifying the partition to write to. May contain escape sequences. E.g.: If the table is partitioned by (continent:string, country:string, time:string) then 'Asia,India,2014-02-26-01-21' will indicate continent=Asia, country=India, time=2014-02-26-01-21. |
| hive.txnsPerBatchAsk | 100 | Hive grants a batch of transactions instead of single transactions to streaming clients like Flume. This setting configures the number of desired transactions per Transaction Batch. Data from all transactions in a single batch end up in a single file. Flume will write a maximum of batchSize events in each transaction in the batch. This setting in conjunction with batchSize provides control over the size of each file. Note that eventually Hive will transparently compact these files into larger files. |
| heartBeatInterval | 240 | (In seconds) Interval between consecutive heartbeats sent to Hive to keep unused transactions from expiring. Set this value to 0 to disable heartbeats. |

| Property Name | Default | Description |
|-----------------------------|---------|---|
| autoCreatePartitions | true | Flume will automatically create the necessary Hive partitions to stream to. |
| batchSize | 15000 | Max number of events written to Hive in a single Hive transaction. |
| maxOpenConnections | 500 | Allow only this number of open connections. If this number is exceeded, the least recently used connection is closed. |
| callTimeout | 10000 | (In milliseconds) Timeout for Hive & HDFS I/O operations, such as openTxn, write, commit, abort. |
| serializer | - | Serializer is responsible for parsing out field from the event and mapping them to columns in the hive table. Choice of serializer depends upon the format of the data in the event. Supported serializers: DELIMITED and JSON. |
| roundUnit | minute | The unit of the round down value - second, minute or hour. |
| roundValue | 1 | Rounded down to the highest multiple of this (in the unit configured using hive.roundUnit), less than current time. |
| timeZone | Local | Name of the timezone that should be used for resolving the escape sequences in partition, e.g. Time America/Los_Angeles. |
| useLocalTimeStamp | false | Use the local time (instead of the timestamp from the event header) while replacing the escape sequences. |

The following serializers are provided for Hive sink:

- **JSON:** Handles UTF8 encoded Json (strict syntax) events and requires no configuration. Object names in the JSON are mapped directly to columns with the same name in the Hive table. Internally uses org.apache.hive.hcatalog.data.JsonSerDe but is independent of the Serde of the Hive table. This serializer requires HCatalog to be installed.
- **DELIMITED:** Handles simple delimited textual events. Internally uses LazySimpleSerde but is independent of the Serde of the Hive table.

| Property Name | Default | Description |
|----------------------------------|---------|--|
| serializer.delimiter | , | (Type: string) The field delimiter in the incoming data. To use special characters, surround them with double quotes like "\t". |
| serializer.fieldnames | - | The mapping from input fields to columns in hive table. Specified as a comma separated list (no spaces) of hive table columns names, identifying the input fields in order of their occurrence. To skip fields leave the column name unspecified. E.g.. 'time,,IP,message' indicates the 1st, 3rd and 4th fields in input map to time, IP and message columns in the hive table. |
| serializer.serdeSeparator | Ctrl-A | (Type: character) Customizes the separator used by underlying serde. |

| Property Name | Default | Description |
|---------------|---------|--|
| | | There can be a gain in efficiency if the fields in <code>serializer.fieldnames</code> are in same order as table columns, the <code>serializer.delimiter</code> is same as the <code>serializer.serdeSeparator</code> and number of fields in <code>serializer.fieldnames</code> is less than or equal to number of table columns, as the fields in incoming event body do not need to be reordered to match order of table columns. Use single quotes for special characters like <code>'\t'</code> . Ensure input fields do not contain this character. Note: If <code>serializer.delimiter</code> is a single character, preferably set this to the same character. |

The following are the escape sequences supported:

| Alias | Description |
|----------------------|--|
| <code>%{host}</code> | Substitute value of event header named "host". Arbitrary header names are supported. |
| <code>%t</code> | Unix time in milliseconds . |
| <code>%a</code> | Locale's short weekday name (Mon, Tue, ...) |
| <code>%A</code> | Locale's full weekday name (Monday, Tuesday, ...) |
| <code>%b</code> | Locale's short month name (Jan, Feb, ...) |
| <code>%B</code> | Locale's long month name (January, February, ...) |
| <code>%c</code> | Locale's date and time (Thu Mar 3 23:05:25 2005) |
| <code>%d</code> | Day of month (01) |
| <code>%D</code> | Date; same as <code>%m/%d/%y</code> |
| <code>%H</code> | Hour (00..23) |
| <code>%I</code> | Hour (01..12) |
| <code>%j</code> | Day of year (001..366) |
| <code>%k</code> | Hour (0..23) |
| <code>%m</code> | Month (01..12) |
| <code>%M</code> | Minute (00..59) |
| <code>%p</code> | Locale's equivalent of am or pm |
| <code>%s</code> | Seconds since 1970-01-01 00:00:00 UTC |
| <code>%S</code> | Second (00..59) <code>%y</code> last two digits of year (00..99) |
| <code>%Y</code> | Year (2015) |
| <code>%z</code> | +hhmm numeric timezone (for example, -0400) |

Example Hive table:

```
create table weblogs ( id int , msg string )
partitioned by (continent string, country string, time string)
clustered by (id) into 5 buckets
stored as orc;
```

Example for agent named a1:

```
a1.channels = c1
a1.channels.c1.type = memory
a1.sinks = k1
a1.sinks.k1.type = hive
a1.sinks.k1.channel = c1
a1.sinks.k1.hive.metastore = thrift://127.0.0.1:9083
a1.sinks.k1.hive.database = logsdb
a1.sinks.k1.hive.table = weblogs
a1.sinks.k1.hive.partition = asia, %{country}, %Y-%m-%d-%H-%M
a1.sinks.k1.useLocalTimeStamp = false
a1.sinks.k1.round = true
a1.sinks.k1.roundValue = 10
a1.sinks.k1.roundUnit = minute
a1.sinks.k1.serializer = DELIMITED
a1.sinks.k1.serializer.delimiter = "\t"
a1.sinks.k1.serializer.serdeSeparator = '\t'
a1.sinks.k1.serializer.fieldnames = id, msg
```



Tip

For all of the time related escape sequences, a header with the key “timestamp” must exist among the headers of the event (unless `useLocalTimeStamp` is set to true). One way to add this automatically is to use the `TimestampInterceptor`.

The above configuration will round down the timestamp to the last 10th minute. For example, an event with timestamp header set to 11:54:34 AM, June 12, 2012 and ‘country’ header set to ‘india’ will evaluate to the partition (continent=‘asia’,country=‘india’,time=‘2012-06-12-11-50’). The serializer is configured to accept tab separated input containing three fields and to skip the second field.