Cluster RCA Summary Publisher RFC

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Introduction

This document introduces the design and architecture of Cluster RCA Summary Publisher. The publisher is modeled as a node in the RCA graph that reads updates from upstream cluster rca nodes and publishes the summary to a set of listeners. The publisher node receives the flow units from several upstream Cluster RCAs and stores the summary in a map-like format. A listener plugin reads the cluster summary data and publishes it to a configurable Kafka queue for consumer's analysis.

Motivation

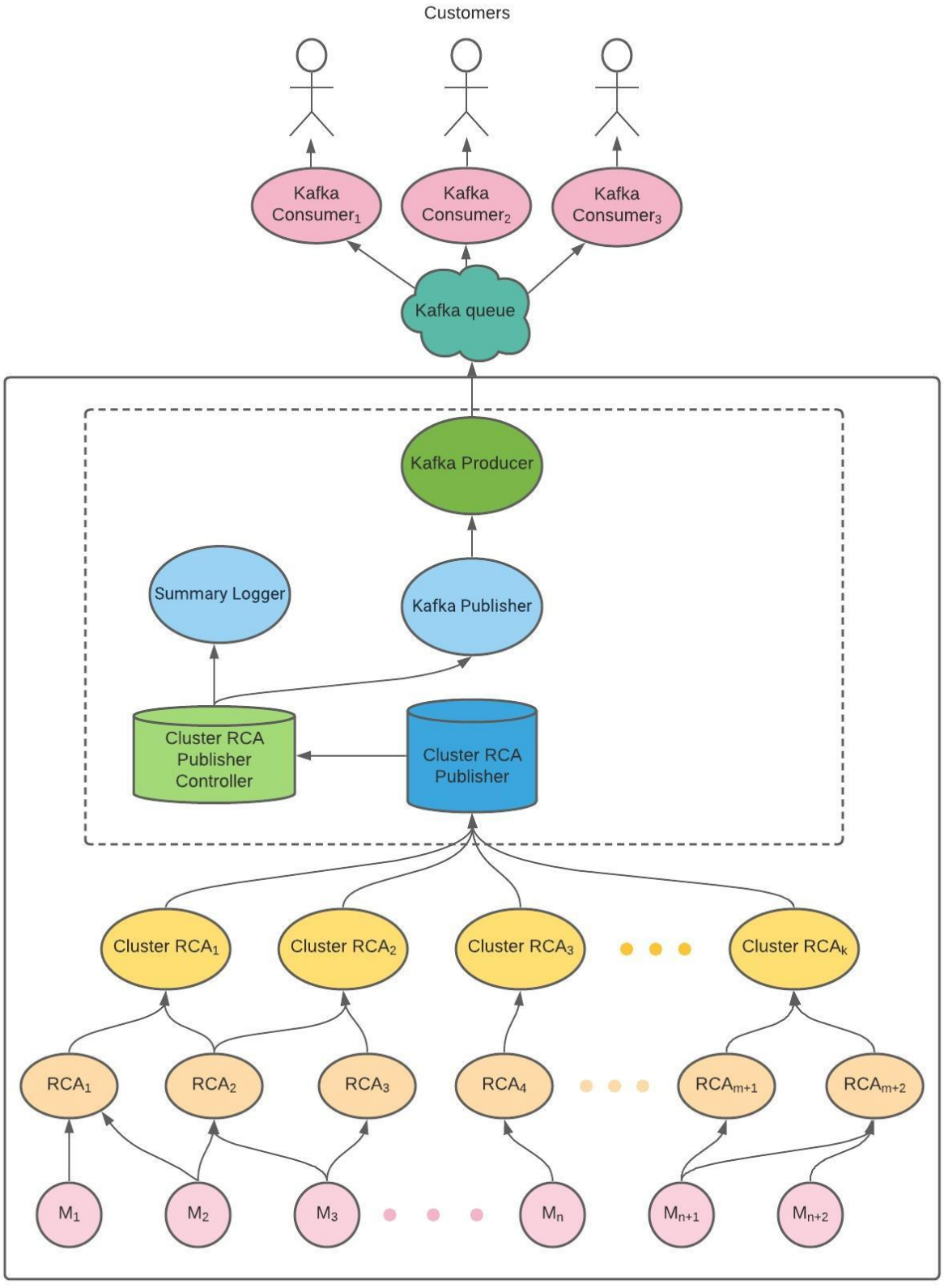
Currently the PA-RCA framework allows users to fetch RCA data through an API request. Users can always query this API endpoint periodically to get cluster rca summaries. However, this approach increases overhead on both the client and server side. Besides that, the number of incoming API requests coming in from several consumers may exceed the query limit. An alternate solution to this problem is to follow an event-driven model, where the server listens to cluster RCA summaries and publishes it to a message bus such as a Kafka queue on-demand. Clients can then consume the data in the message bus via a Kafka consumer which has been set up.

Requirement

The Cluster RCA Publisher should be responsible for:

1. Capturing flow units from cluster level RCAs and filtering out cluster information and relevant summaries.
2. Maintaining valid cluster RCA summaries in a map-like datastore
3. Allowing multiple plugins to listen to the Cluster RCA summary publisher and receive updates
4. Pushing the outputs to a configurable Kafka queue at a given evaluation time interval.

Architecture


Customers
Kafka Consumer1
Kafka Consumer2
Kafka Consumer3
Kafka queue
Kafka Producer
Summary Logger
Kafka Publisher
Cluster RCA Publisher Controller
Cluster RCA Publisher
Cluster RCA1
Cluster RCA2
Cluster RCA3
Cluster RCAk
RCA1
RCA2
RCA3
RCA4
RCAm+1
RCAm+2
M1
M2
M3
Mn
Mn+1
Mn+2

Key Components

Metrics and RCAs

The PA-RCA framework is modeled as a distributed data flow graph. Leaf nodes observe and collect fine-grained metrics and then push the metric data as a flow unit to their parent RCA nodes. RCA nodes can conduct analysis on the input metrics and generate data as flow units including summary of observed resource and decisions to resolve the problem. The summary and decision of a single RCA can then be listened by cluster RCAs, which can collect data from different RCAs to conduct cluster level observation and generate higher level diagnosis and decisions. The output of cluster level RCAs contain summaries for both individual node and cluster level.

Cluster RCA Publisher

The Cluster RCA Publisher is added as a downstream node for all cluster level RCAs. It collects resource flow units from upstream cluster RCA nodes at fixed time interval, and maintains the latest summary of each cluster RCA in a map-like datastore. Plugins that listen to the Cluster RCA Publisher can be added through Cluster RCA Publisher Controller to get access to the cluster rca summaries.

Kafka Publisher

The Kafka Publisher is a plugin and a RCA summary listener added to the Cluster RCA Publisher. It takes the latest cluster summaries as input, filters the non-empty cluster summaries in the datastore, and formats the information as json . It can then initiate an instance of Kafka producer to publish the formatted cluster RCA summaries into a configurable Kafka queue.

Kafka Consumer

A preconfigured Kafka Consumer is setup for consumers to use. Consumers can get the RCA data periodically from the Kafka queue without the need to request from an API endpoint. Users can also use their own configuration to setup Kafka consumer, or setting up Kafka sink connector to push cluster RCA summaries into other system (such as local Elasticsearch cluster) for analysis.

Use Cases

1. Users can setup the configuration of Kafka producer including the topic name to receive cluster rca summaries, kafka bootstrap server.
2. Users can add their own plugins in Cluster RCA Publisher to use cluster RCA summary data for other analysis
3. Users can use the pre-configured Kafka consumer to read cluster RCA summaries from the kafka queue without periodically making any API request.

Appendix

Open source components used to build the tool

- Apache Kafka