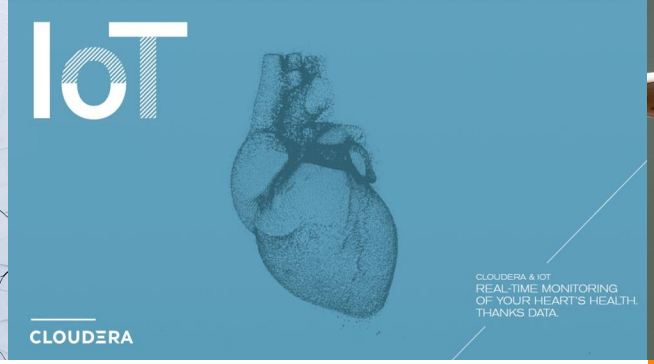
CLOUDERA

Big Data Conference: Building Real-Time Travel Alerts

Tim Spann
Principal Developer Advocate

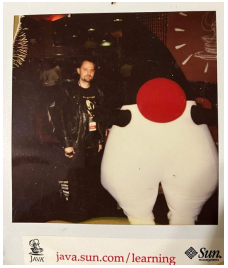
22-Nov-2023

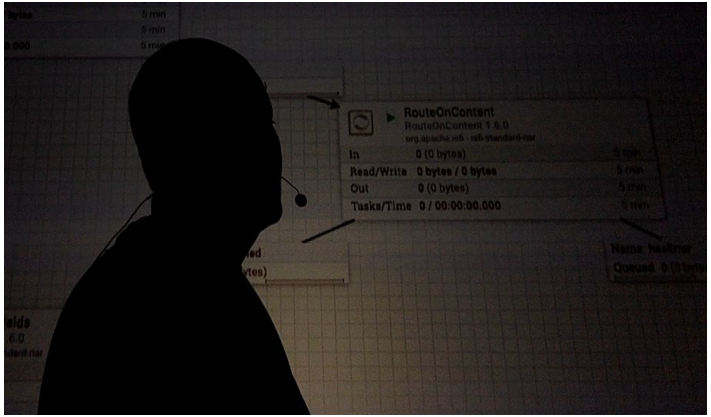


CLOUDERA

EDGE
2AI
CLOUDERA

ENTERPRISE
DATA
CLOUD
CLOUDERA





Tim Spann

Twitter: @**PaasDev** // Blog: **datainmotion.dev**

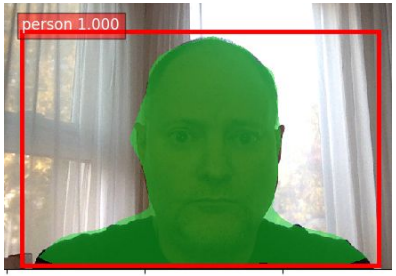
Principal Developer Advocate.

Princeton Future of Data Meetup.

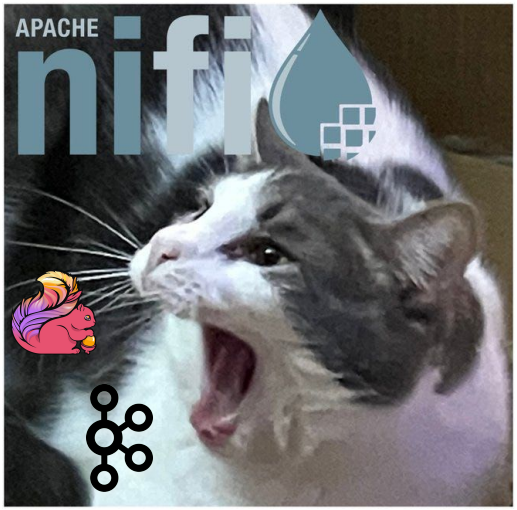
ex-Pivotal, ex-Hortonworks, ex-StreamNative, ex-PwC

https://medium.com/@tspann

https://github.com/tspannhw



FLaNK Stack Weekly by Tim Spann

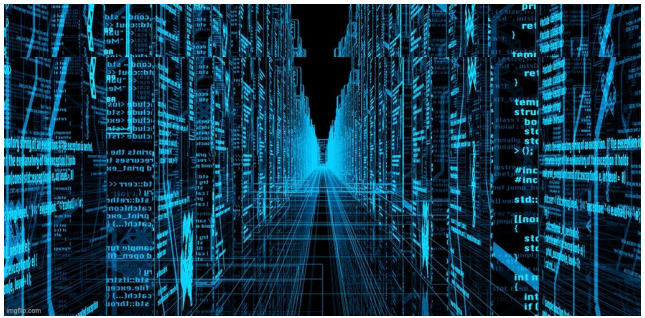


https://bit.ly/32dAJft

https://www.meetup.com/futureofdata-princeton/

This week in Apache NiFi, Apache Flink, Apache Kafka, ML, AI, Apache Spark, Apache Iceberg, Python, Java and Open Source friends.

Future of Data - NYC + NJ + Philly + Virtual



https://www.meetup.com/futureofdata-princeton/

From Big Data to AI to Streaming to Containers to Cloud to Analytics to Cloud Storage to Fast Data to Machine Learning to Microservices to ...

ICEBERG

@PaasDev

CODE / DEEP DIVE

DESCRIPTION

In this session, we will walk through how to build a complete streaming application to send alerts based on travel advisories from public data. We will also join in other data sources of relevance and push out alerts.

We will show you how to build this streaming application with Apache NiFi, Apache Kafka, and Apache Flink and show you when/why/how, and what to build to maximize performance, productivity, and ease of development.

Let's get streaming.

Introduction

Overview

Examples

Apache Kafka

Apache Flink

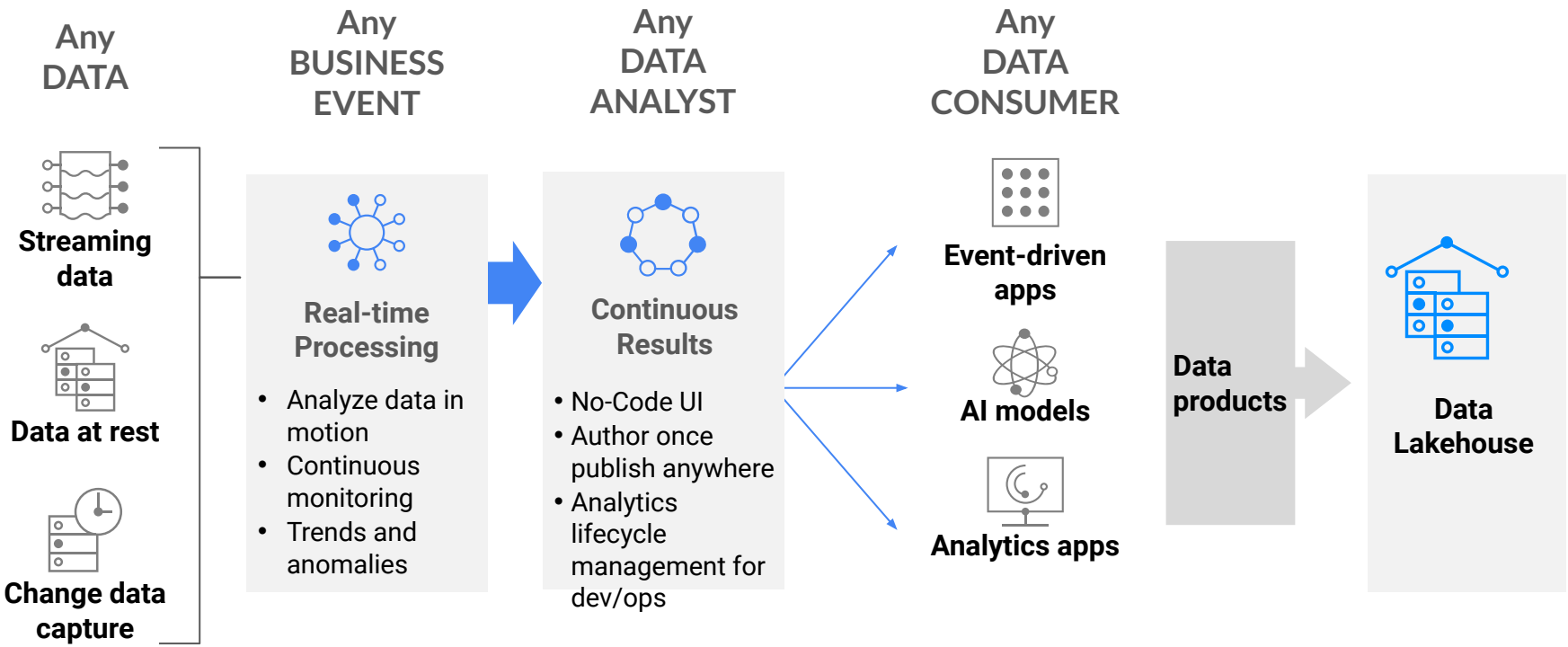
Apache NiFi

Demos

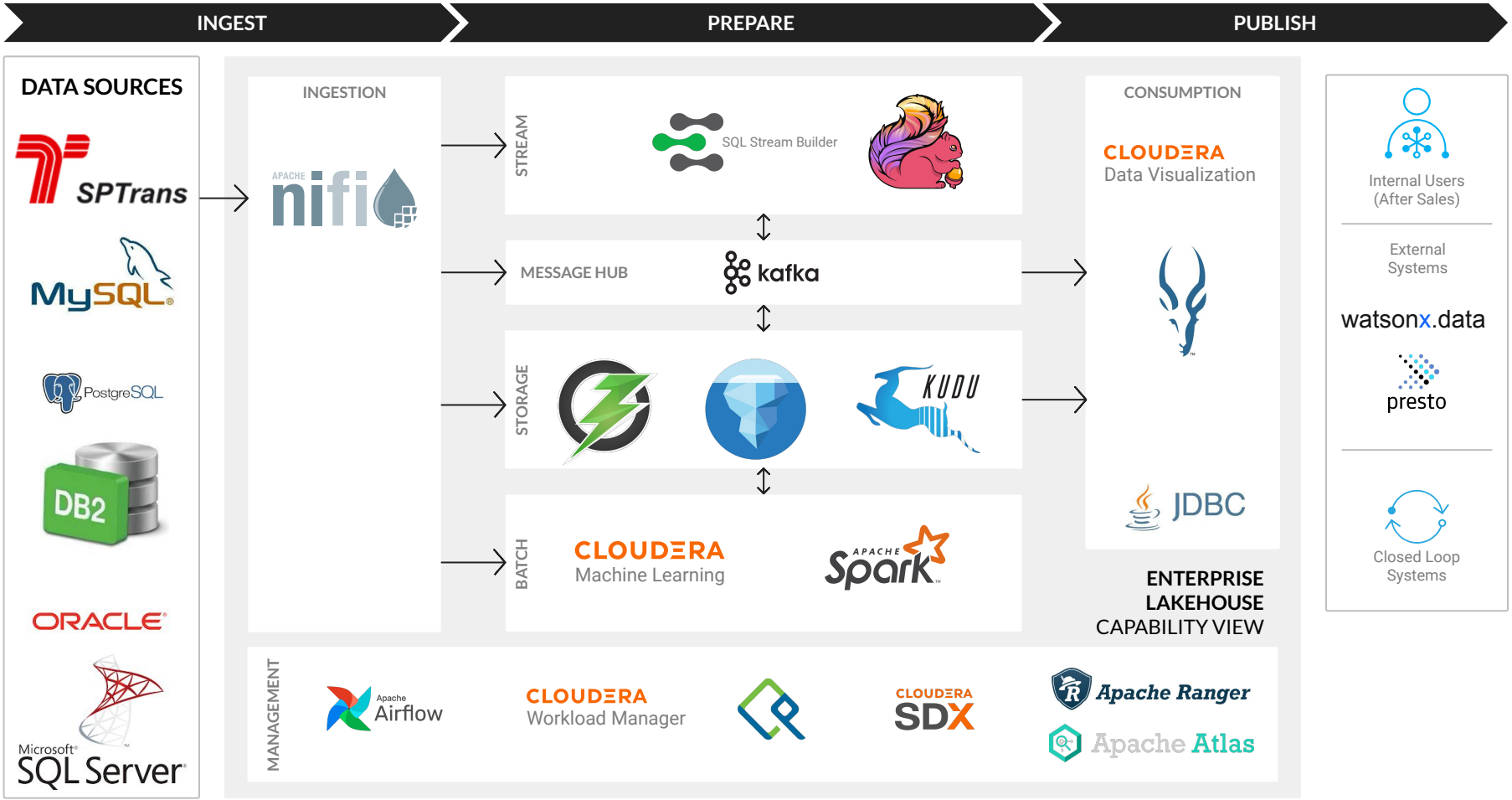
Trains, Planes and Automobiles +++

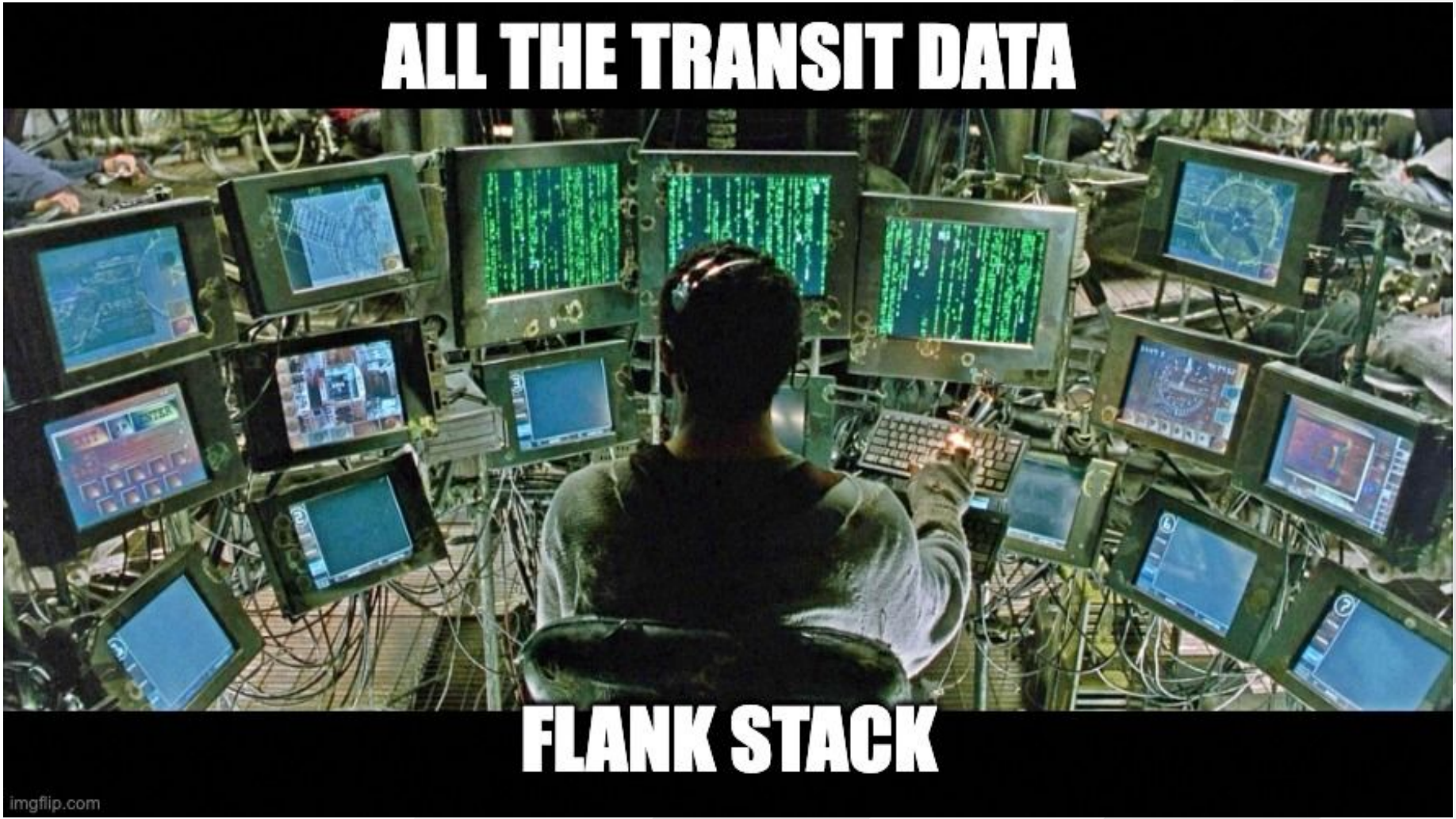
Information Needed	Data Feed(s)
Local weather conditions	• XML, JSON, RSS
Mass transit status & alerts	• XML, JSON, RSS
Regional highways & tunnels	• GeoRSS, XML, ProtoBuf, JSON
Local social media	• JSON
ADS-B Plane Data	• JSON
Local air quality	• JSON

Data Relevance



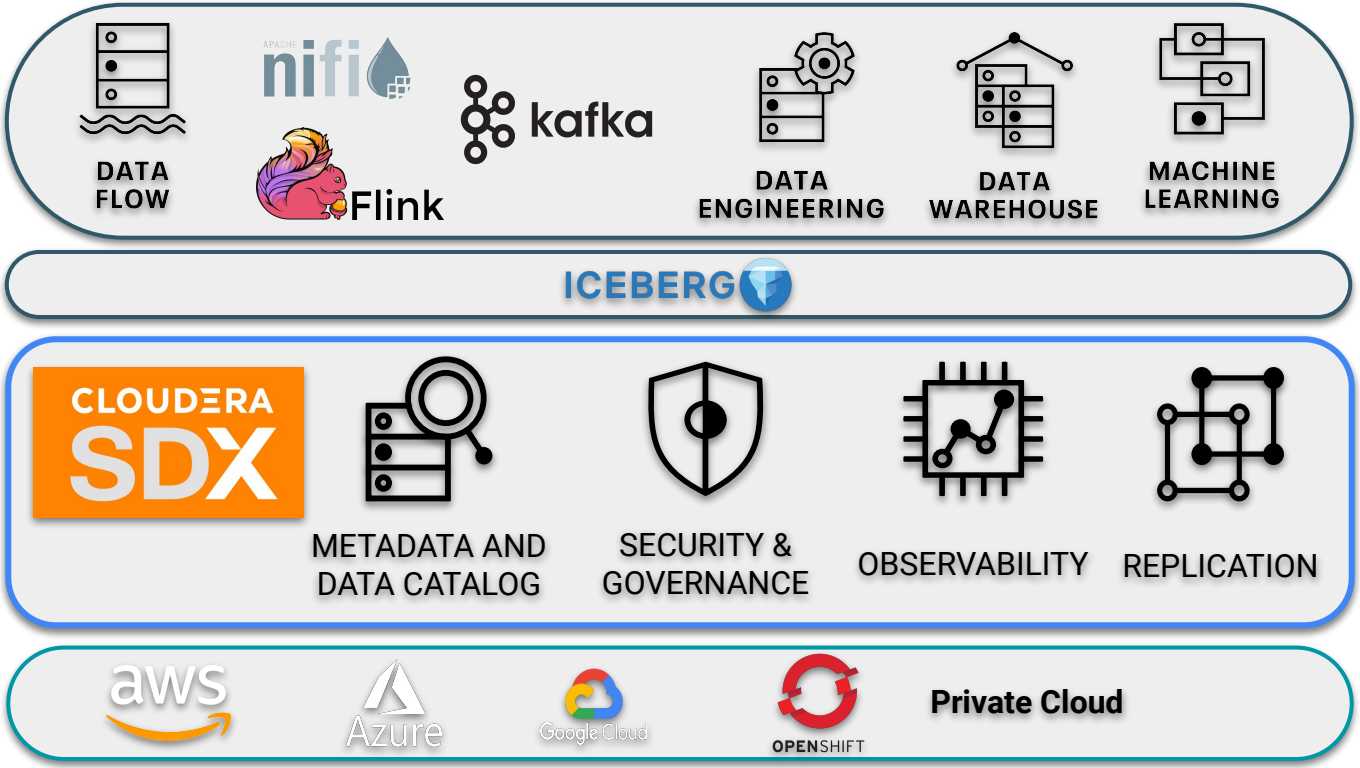
REST API ARCHITECTURE - Using FLaNK to pull the data out of anything in near-real time




ALL THE TRANSIT DATA
FLANK STACK
imgflip.com

REAL-TIME REQUIRES A PLATFORM

CDP: AN OPEN DATA LAKEHOUSE




nifi
0
53,639 / 153.08 MB
0
0
230
831
546
160
0
0

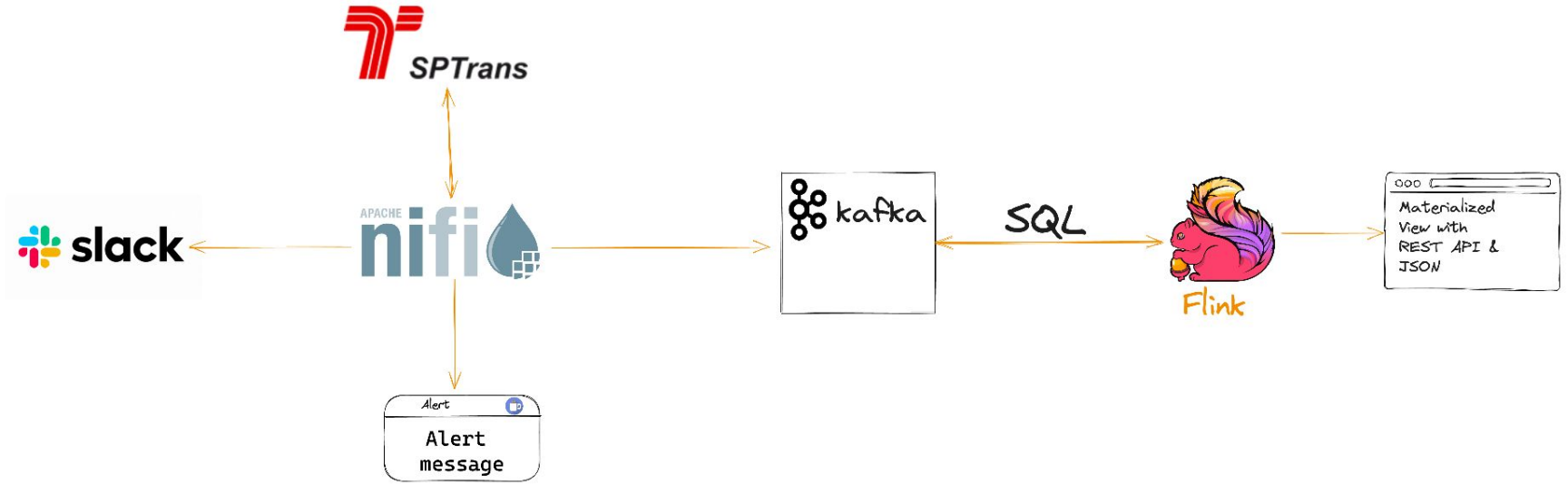
EXAMPLES


CUNK ON FLANK
THEY SAY IT'S FOR FAST DATA
IS IT SO FAST THAT IT ARRIVES BEFORE I ASKED FOR IT
imgflip.com

NiFi/Kafka/Flink - Data Tables - Brazil SPTrans

Show 10 entries

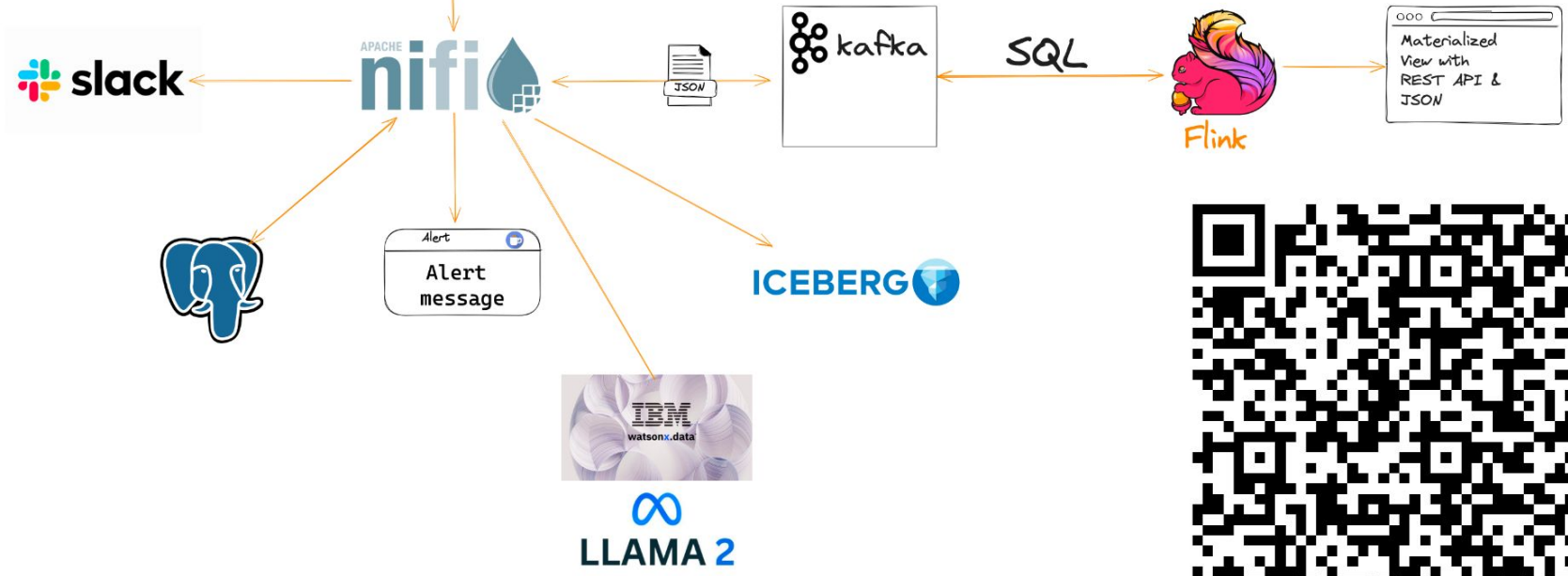
HR	Vehicle	Line ID	Line Origin	Line Destination	Lat/Long
17:08	21434	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.537837,-46.63
17:08	21243	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.529571,-46.59
17:08	21242	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.4884085,-46.5
17:08	21399	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.47630525,-46.5


SPTrans
slack
APACHE
nifi
kafka
SQL
Flink
Materialized
View with
REST API &
JSON
Alert
Alert
message

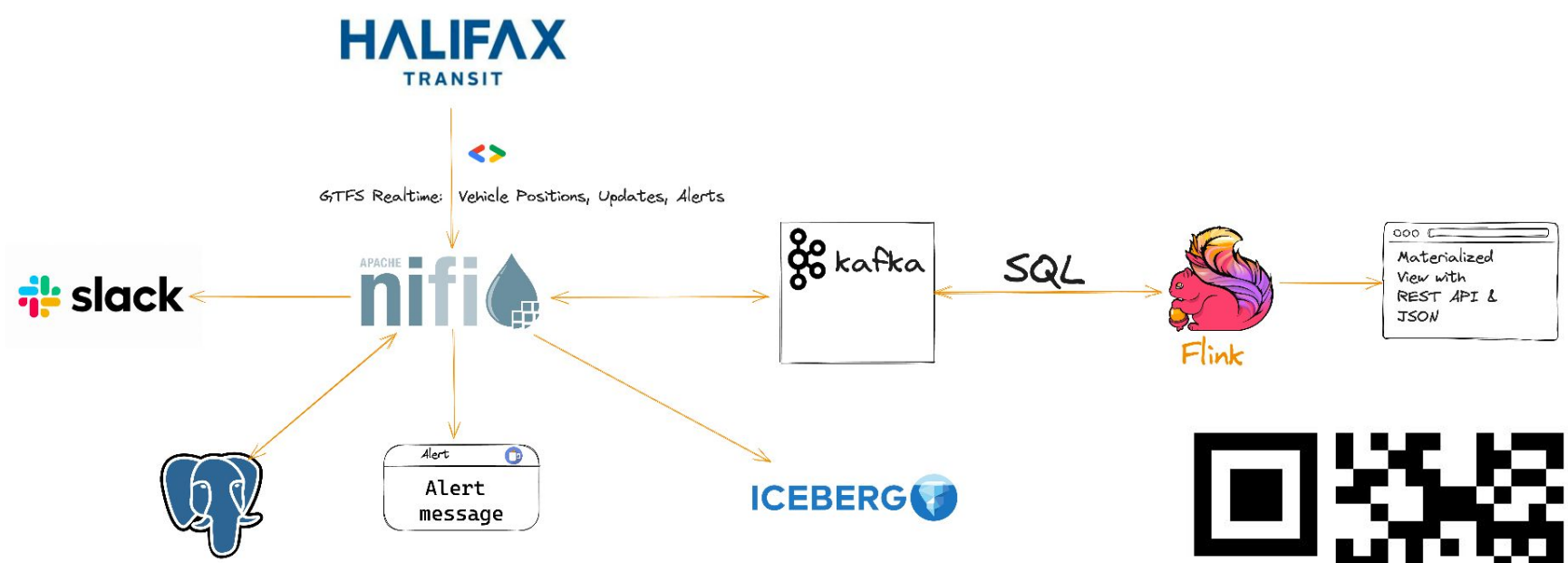
https://github.com/MobilityData/mobility-database-catalogs/

Every Transit System

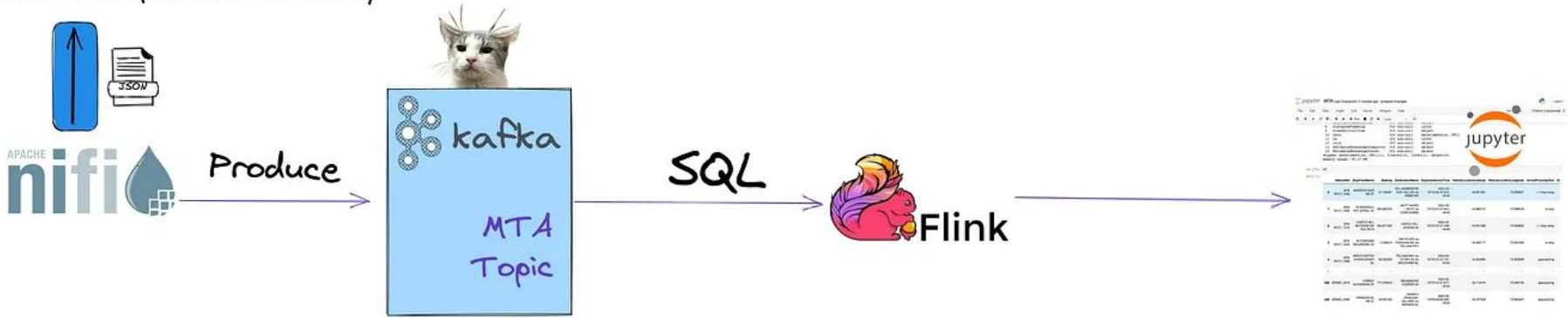
GTFS Realtime: Vehicle Positions, Updates, Alerts



CLOUDERA

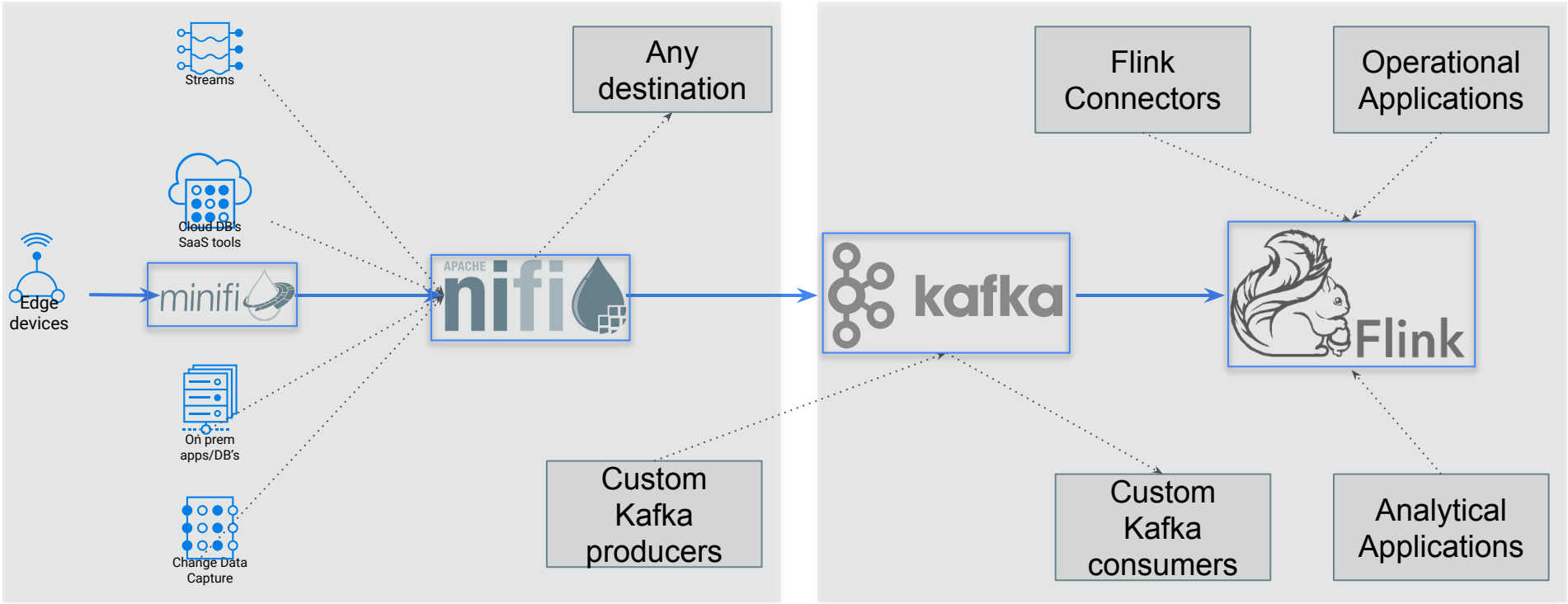

HALIFAX
TRANSIT
GTFS Realtime: Vehicle Positions, Updates, Alerts
slack
APACHE
nifi
kafka
SQL
Flink
Materialized
View with
REST API &
JSON
Alert
Alert
message
ICEBERG

Metropolitan Transportation Authority



CLOUDERA

Streaming Data Pipelines with Cloudera Data Platform



STREAMING DATA MOVEMENT & PROCESSING

STREAMING DATA PROCESSING & ANALYTICS

APACHE KAFKA

What is Apache Kafka?

Distributed: horizontally scalable

Partitioned: the data is split-up and distributed across the brokers

Replicated: allows for automatic failover

Unique: Kafka does not track the consumption of messages (the consumers do)

Fast: designed from the ground up with a focus on performance and throughput

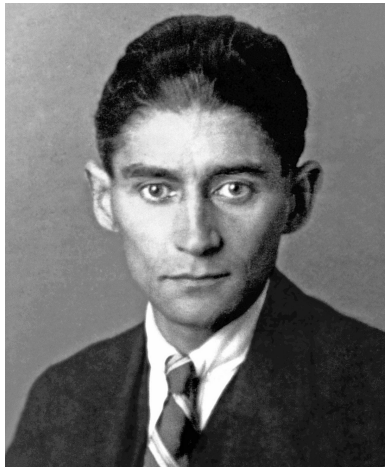
Kafka was built at Linkedin in 2011

Open sourced as an Apache project

Yes, Franz, It’s Kafka

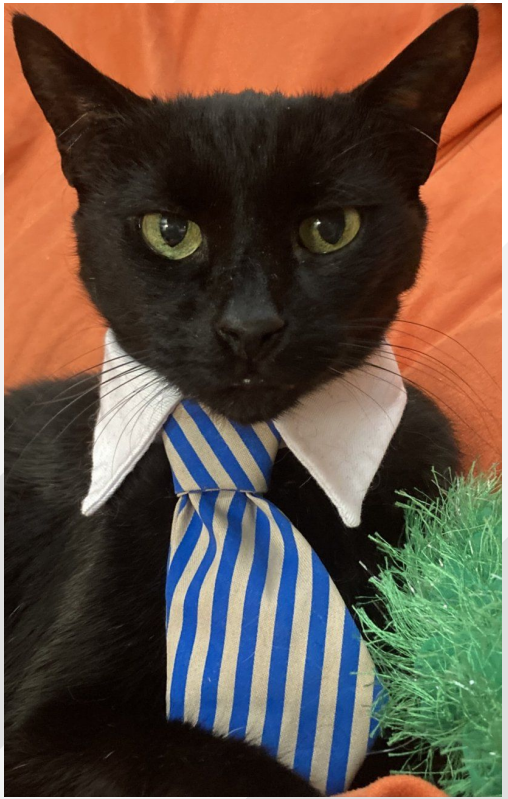
Let’s do a metamorphosis on your data. Don’t fear changing data.

You don’t need to be a brilliant writer to stream data.



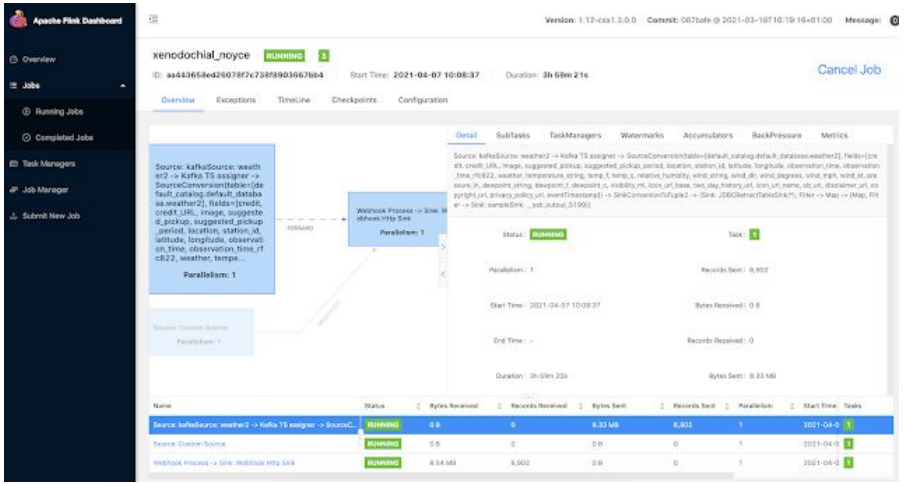
Franz Kafka was a German-speaking Bohemian novelist and short-story writer, widely regarded as one of the major figures of 20th-century literature. His work fuses elements of realism and the fantastic.
Wikipedia

APACHE FLINK



Flink SQL

- Streaming Analytics
- Continuous SQL
- Continuous ETL
- Complex Event Processing
- Standard SQL Powered by Apache Calcite



https://www.datainmotion.dev/2021/04/cloudera-sql-stream-builder-ssb-updated.html

DATAFLOW APACHE NIFI

Apache NiFi in a few numbers

A very active project with a dynamic community

2800+ members on the Slack channel (535+ - 4 years ago)

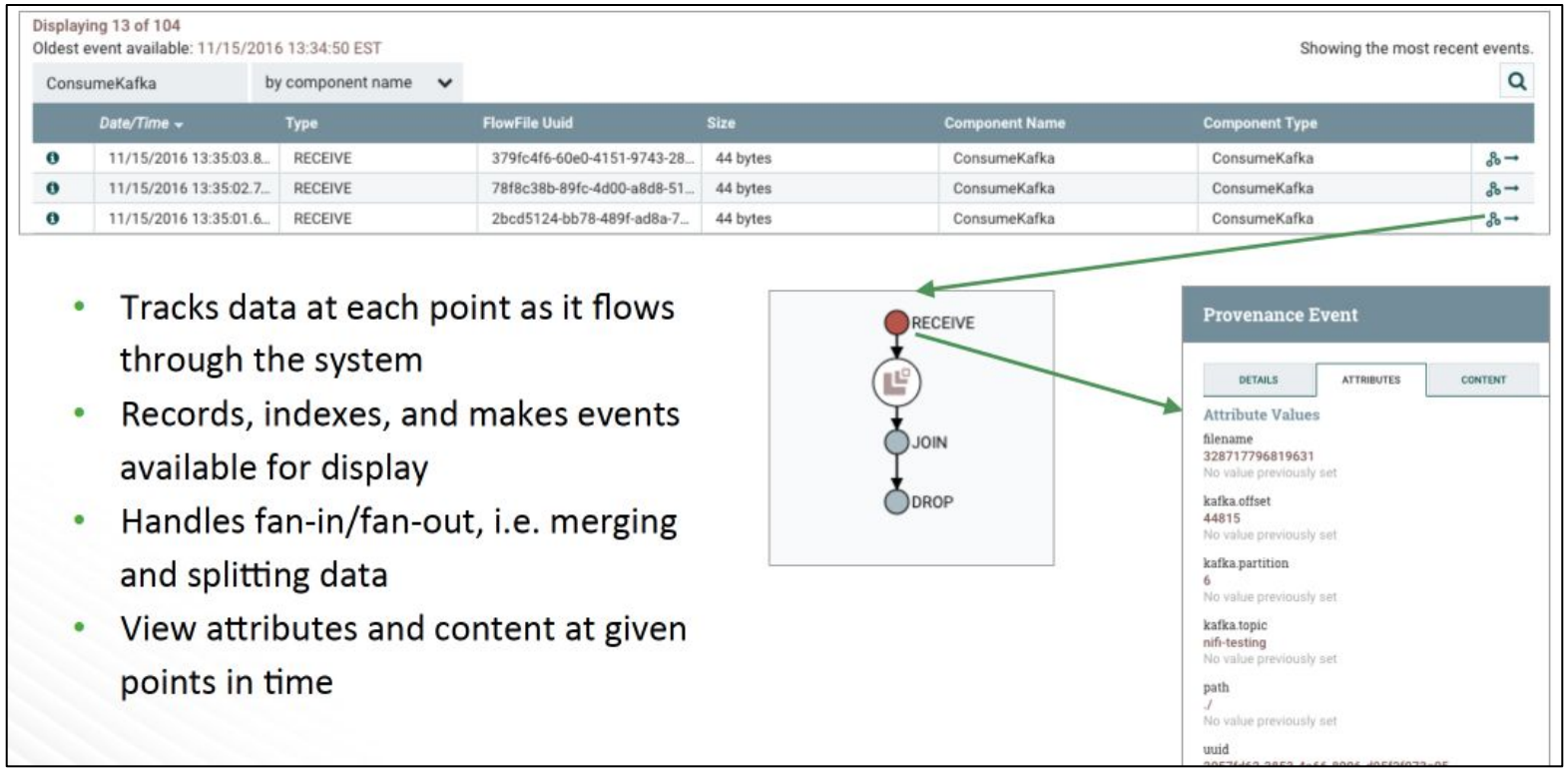
475+ contributors on Github across the repositories (260+ - 4 years ago)

65 committers in the Apache NiFi community (45 - 4 years ago)

Apache NiFi 1.23.2 is the latest release, NiFi 2.0 coming soon (NiFi 1.10 - 4 years ago)

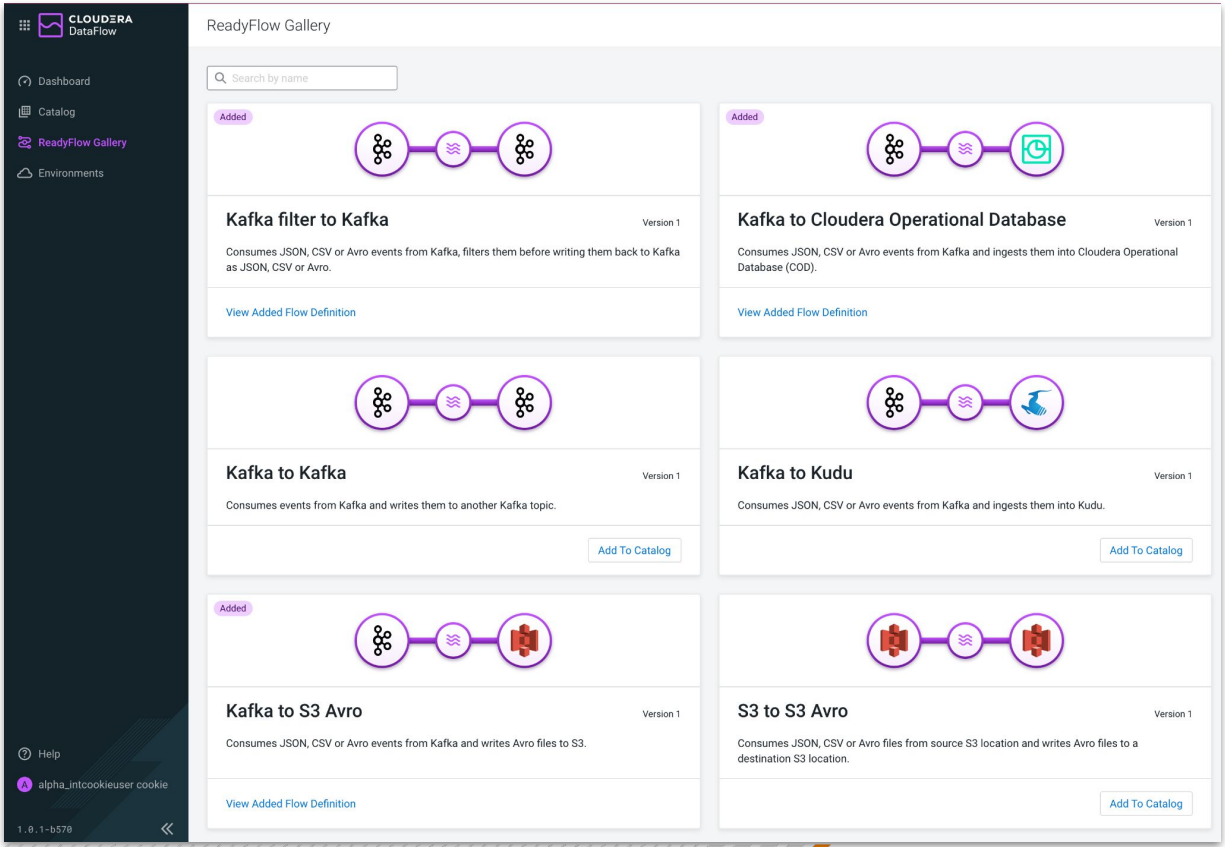
14M+ docker pulls of the Apache NiFi image (1M+ - 4 years ago)

Provenance



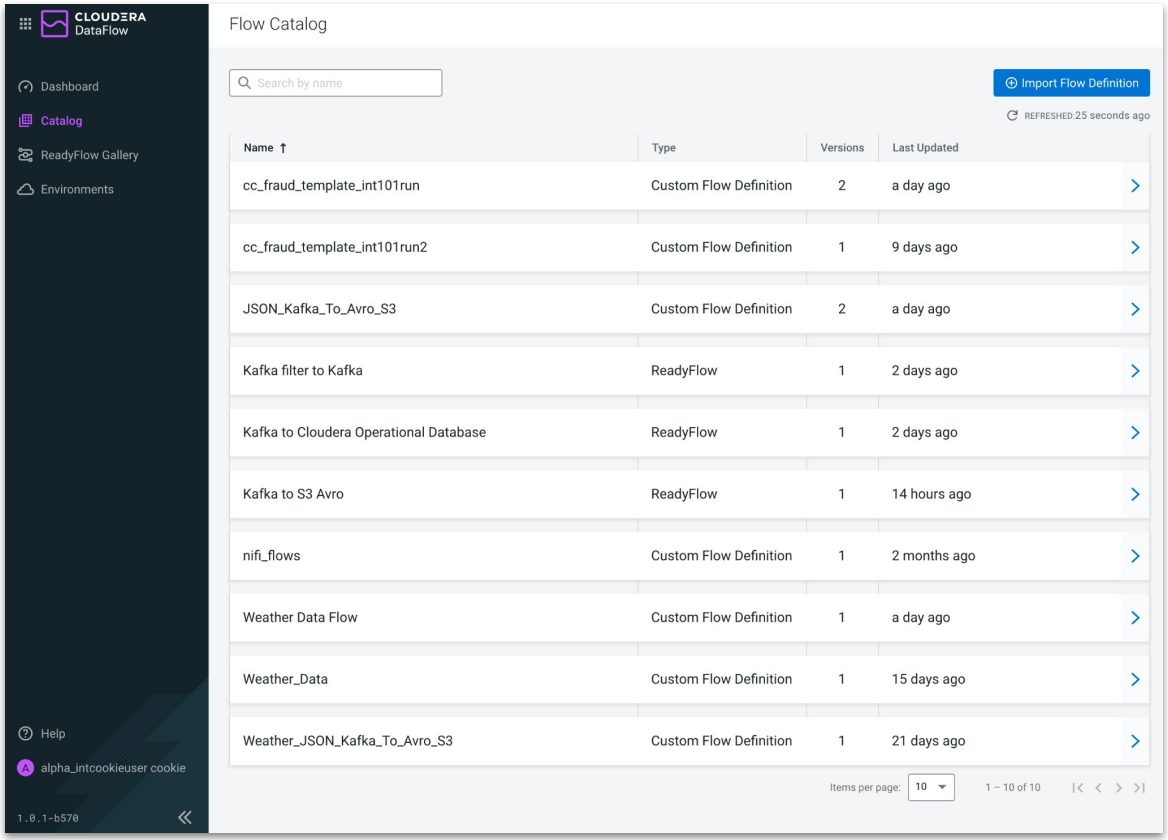
ReadyFlow Gallery

- Cloudera provided flow definitions
- Cover most common data flow use cases
- Optimized to work with CDP sources/destinations
- Can be deployed and adjusted as needed



Flow Catalog

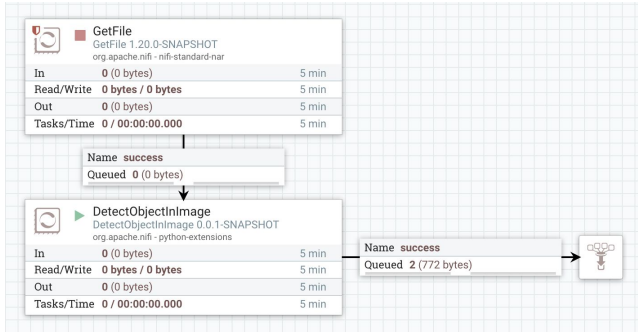
- Central repository for flow definitions
- Import existing NiFi flows
- Manage flow definitions
- Initiate flow deployments



Apache NiFi with Python Custom Processors

Python as a 1st class citizen

```
import cv2
import numpy as np
import json
from nifiapi.properties import PropertyDescriptor
from nifiapi.properties import ResourceDefinition
from nifiapi.flowfiletransform import FlowFileTransformResult

SCALE_FACTOR = 0.00392
NMS_THRESHOLD = 0.4     # non-maximum suppression threshold
CONFIDENCE_THRESHOLD = 0.5

class DetectObjectInImage:
    class Java:
        implements = ['org.apache.nifi.python.processor.FlowFileTransform']
    class ProcessorDetails:
        version = '0.0.1-SNAPSHOT'
        dependencies = ['numpy >= 1.23.5', 'opencv-python >= 4.6']

    def __init__(self, jvm=None, **kwargs):
        self.jvm = jvm

        # Build Property Descriptors
        self.model_file = PropertyDescriptor(
            name = 'Model File',
            description = 'The binary file containing the trained Deep Neural Network weights. Supports Caffe (*.caffemodel), TensorFlow (*.pb), Torch (*.t7, *.net), Darknet (*.weights), ' +
                          'DLDT (*.bin), and ONNX (*.onnx)',
            required = True,
            resource_definition = ResourceDefinition(allow_file = True)
        )
        self.config_file = PropertyDescriptor(
            name = 'Network Config File',
            description = 'The text file containing the Network configuration. Supports Caffe (*.prototxt), TensorFlow (*.pbtxt), Darknet (*.cfg), and DLDT (*.xml)',
            required = False,
            resource_definition = ResourceDefinition(allow_file = True)
        )
        self.class_name_file = PropertyDescriptor(
            name = 'Class Names File',
            description = 'A text file containing the names of the classes that may be detected by the model. Expected format is one class name per line, new-line terminated."',
            required = True,
            resource_definition = ResourceDefinition(allow_file = True)
        )
        self.descriptors = [self.model_file, self.config_file, self.class_name_file]

    def getPropertyDescriptors(self):
        return self.descriptors

    def onScheduled(self, context):
        # read class names from text file
        class_name_file = context.getProperty(self.class_name_file.name).getValue()
        if class_name_file is None:
```



FREE LEARNING ENVIRONMENT

CSP Community Edition

- Kafka, KConnect, SMM, SR, Flink, and SSB in Docker
- Runs in Docker
- Try new features quickly
- Develop applications locally

- Docker compose file of CSP to run from command line w/o any dependencies, including Flink, SQL Stream Builder, Kafka, Kafka Connect, Streams Messaging Manager and Schema Registry
  - `$>docker compose up`
- Licensed under the Cloudera Community License
- **Unsupported**
- Community Group Hub for CSP
- Find it on docs.cloudera.com under Applications

CSP Community Edition

A readily available, dockerized deployment of Apache Kafka and Apache Flink that allows you to test the features and capabilities of Cloudera Stream Processing.

Learn More

https://www.cloudera.com/downloads/cdf/csp-community-edition.html

Open Source Edition

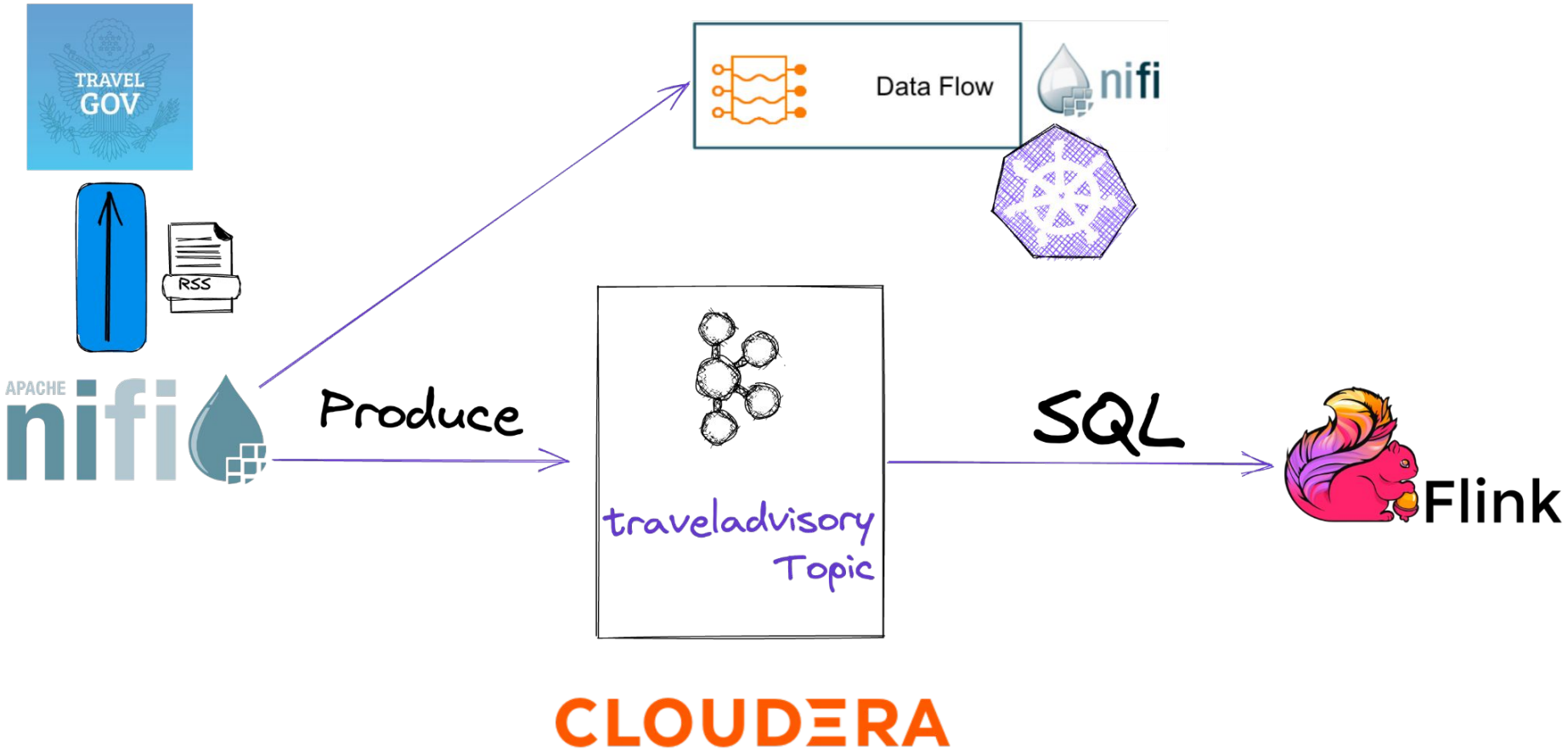
- Apache NiFi in Docker
- Runs in Docker
- Try new features quickly
- Develop applications locally

- Docker NiFi
  - `docker run --name nifi -p 8443:8443 -d -e SINGLE_USER_CREDENTIALS_USERNAME=admin -e SINGLE_USER_CREDENTIALS_PASSWORD=ctsBtRBKHRAx69EqUghvvgEvjnaLjFEB apache/nifi:latest`

- Licensed under the ASF License
- **Unsupported**

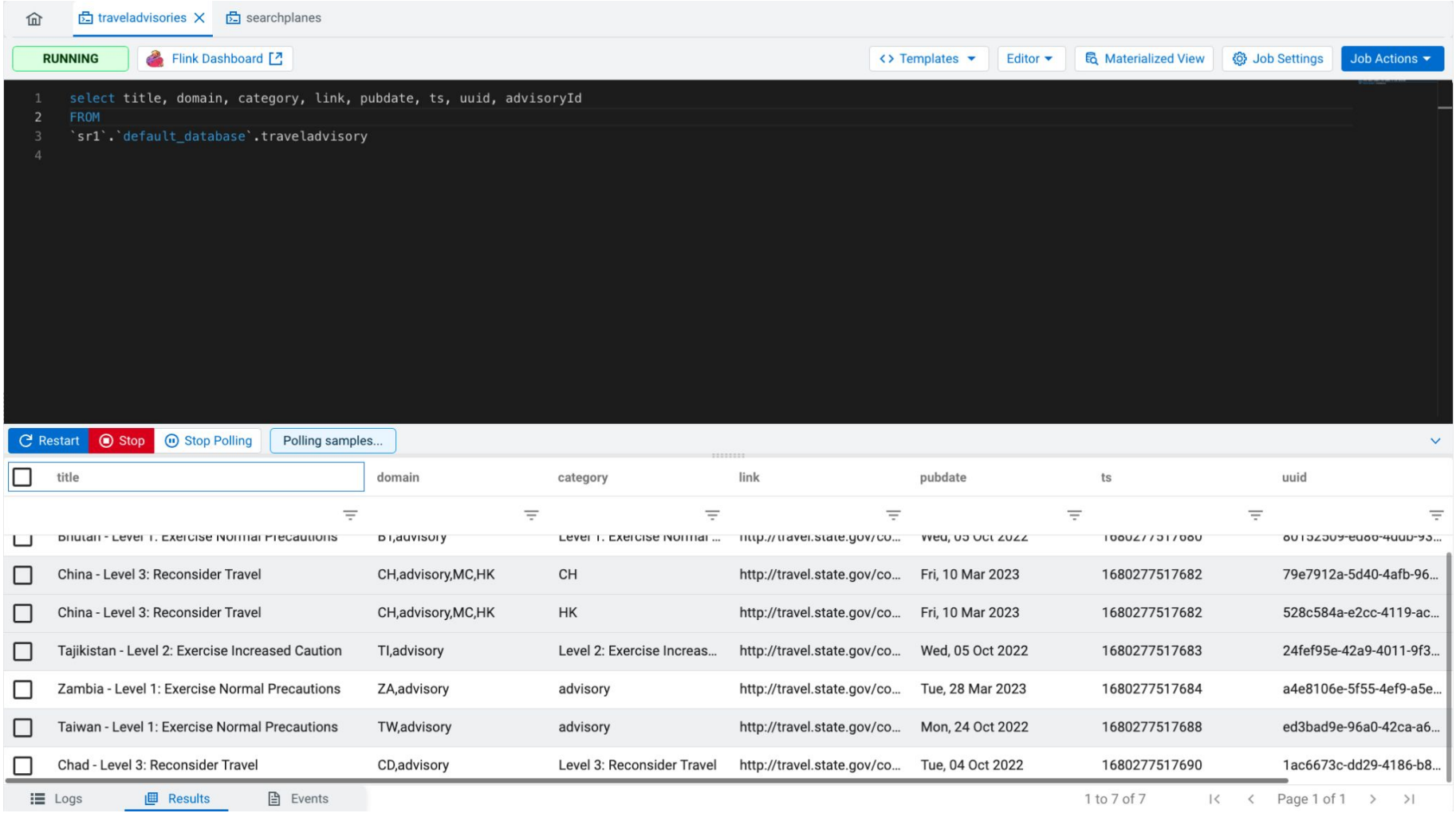
https://hub.docker.com/r/apache/nifi

DEMO / CODE



CLOUDERA

https://github.com/tspannhw/FLaNK-TravelAdvisory


traveladvisories
searchplanes
RUNNING
Flink Dashboard
Templates
Editor
Materialized View
Job Settings
Job Actions
select title, domain, category, link, pubdate, ts, uuid, advisoryId
FROM
`sr1`.`default_database`.traveladvisory
Restart
Stop
Stop Polling
Polling samples...
title
domain
category
link
pubdate
ts
uuid
China - Level 3: Reconsider Travel
CH,advisory,MC,HK
CH
http://travel.state.gov/co...
Fri, 10 Mar 2023
1680277517682
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China - Level 3: Reconsider Travel
CH,advisory,MC,HK
HK
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Tajikistan - Level 2: Exercise Increased Caution
TI,advisory
Level 2: Exercise Increas...
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ZA,advisory
advisory
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Taiwan - Level 1: Exercise Normal Precautions
TW,advisory
advisory
http://travel.state.gov/co...
Mon, 24 Oct 2022
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Chad - Level 3: Reconsider Travel
CD,advisory
Level 3: Reconsider Travel
http://travel.state.gov/co...
Tue, 04 Oct 2022
1680277517690
1ac6673c-dd29-4186-b8...
Logs
Results
Events
1 to 7 of 7
Page 1 of 1

Materialized View

Configuration

Primary Key

uuid

Retention (Seconds)

Min Row Retention Count

10000

API Key

traveladvisory1

Enable MV

Recreate on Job Start

Ignore NULLs

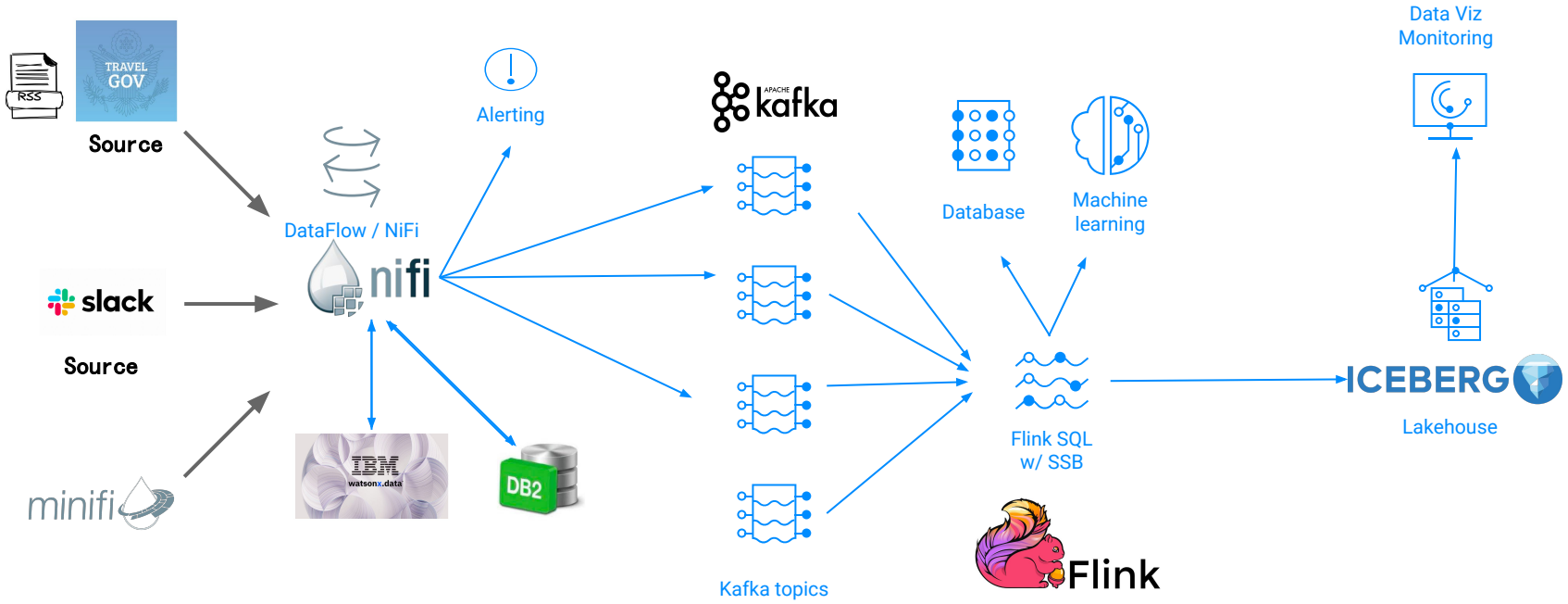
Queries

Add New Query

/api/v1/query/5201/travel?key=66ba91a9-507f-422c-bbb4-86250a9f7bb1&limit=100

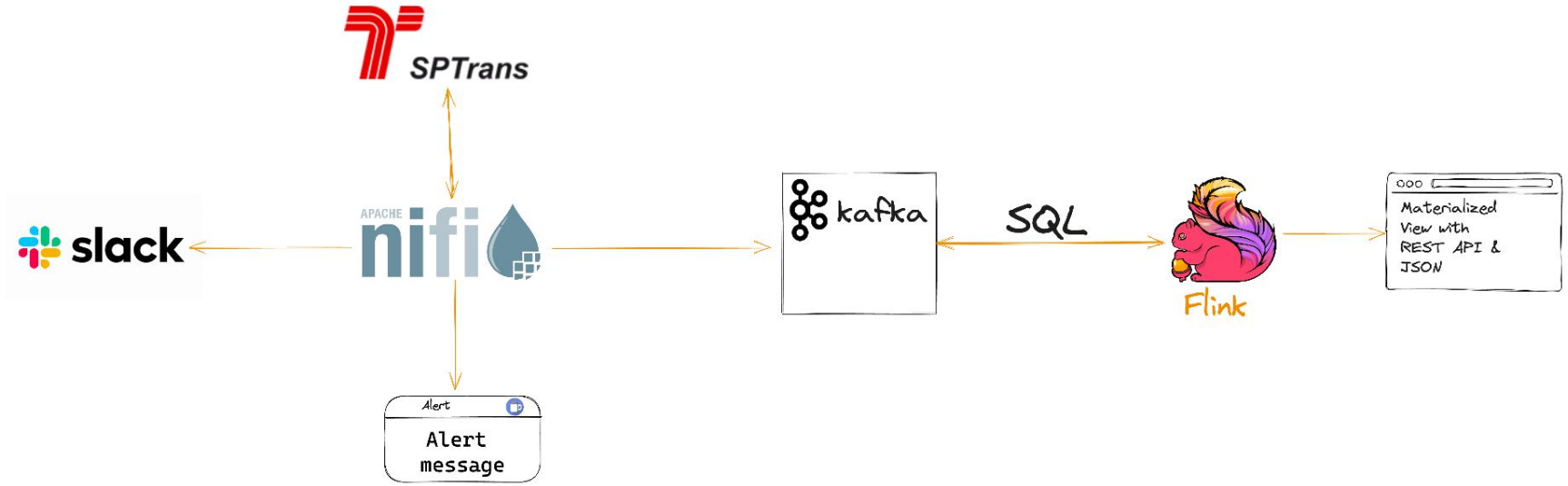
Architecture in the context of Travel Advisories

WatsonX.AI Granite LLM, NiFi, Kafka & Flink



Data in Motion: Overview e Novidades do NiFi, Kafka e Flink

Apresentador: Tim Spann - Principal DIM Specialist and Developer Advocate



https://medium.com/cloudera-inc/transit-in-sao-paulo-brasil-flank-style-eaec6753cc63

NiFi/Kafka/Flink - Data Tables - Brazil SPTrans

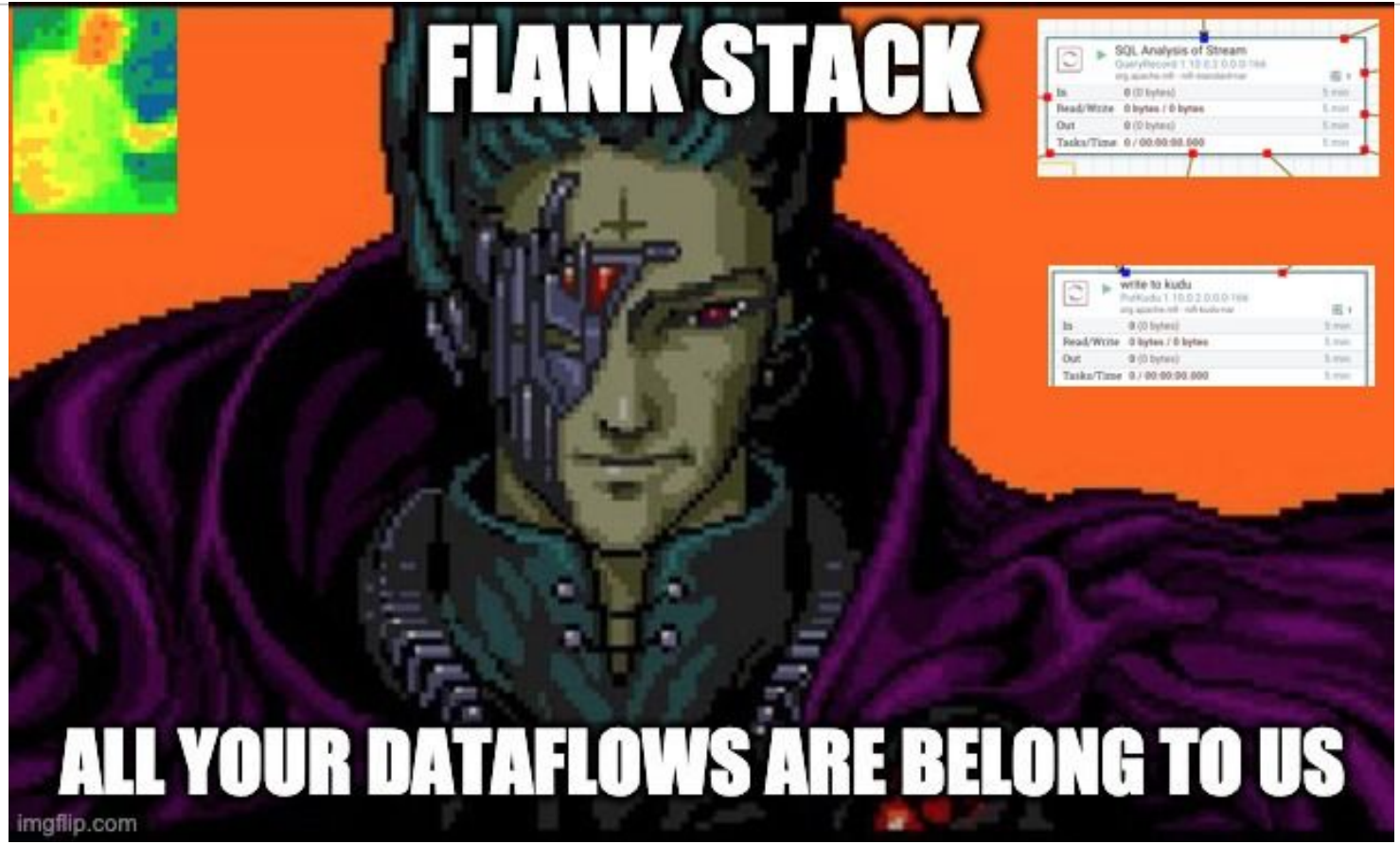
Show 10 entries

Search:

HR	Vehicle	Line ID	Line Origin	Line Destination	Lat/Long	Date/Time
17:08	21434	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.537837,-46.6328475	2023-09-08T20:07:30Z
17:08	21243	33462	PQ. EDU CHAVES	PÇA. DO CORREIO	-23.529571,-46.5984615	2023-09-08T20:07:31Z
17:08	61677	32840	PQ. RES. COCAIA	PQ. IBIRAPUERA	-23.6532785,-46.7017075	2023-09-08T20:07:35Z
17:08	61683	32840	PQ. RES. COCAIA	PQ. IBIRAPUERA	-23.718092,-46.699059	2023-09-08T20:07:20Z
17:08	61517	32840	PQ. RES. COCAIA	PQ. IBIRAPUERA	-23.58114725,-46.6574995	2023-09-08T20:07:28Z
17:08	41014	33514	VL. DALILA	TERM. PQ. D. PEDRO II	-23.5383225,-46.563772	2023-09-08T20:08:04Z
17:08	41019	33514	VL. DALILA	TERM. PQ. D. PEDRO II	-23.5443805,-46.5217695	2023-09-08T20:07:45Z

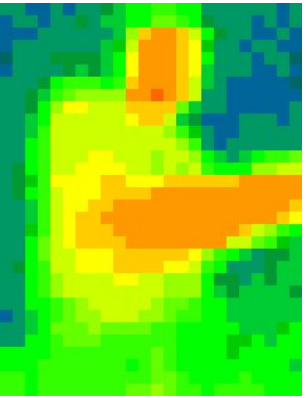
RESOURCES AND WRAP-UP

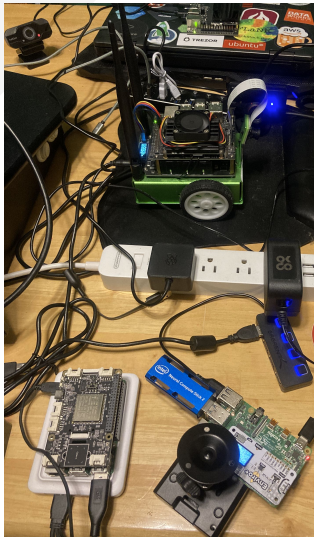
Resources



https://medium.com/@tspann/cdc-not-cat-data-capture-e43713879c03

https://events.dzone.com/dzone/Data-Pipelines-Investigating-the-Modern-Day-Stack





THANK YOU