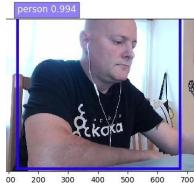




Unlocking Financial Data with Real-Time Pipelines

Tim Spann
Principal Developer Advocate

1-November-2023



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>



 DZone REF CARDS TREND REPORTS EXPERTS

Top IoT Experts



Tim Spann
Principal Developer Advocate,
Cloudera
<https://github.com/tspannhw/SpeakerProfile/>
Tim Spann is a Principal Developer Advocate in Data in Motion for Cloudera. He works with Apache NiFi, Apache Pulsar, Apache...

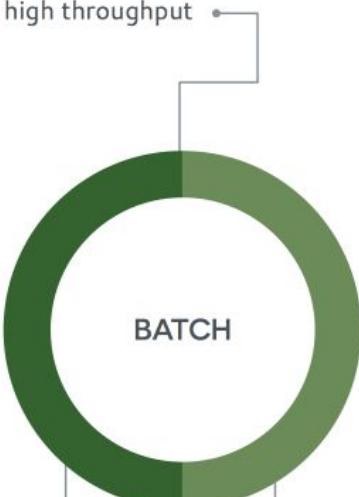


STREAMING

WHAT IS REAL-TIME?

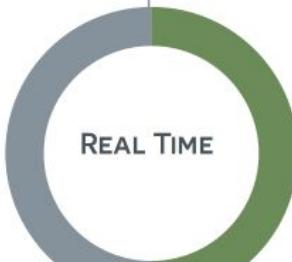
> 1 HOUR

high throughput



10 MS – 1 SEC

approximate



< 500 MS

latency sensitive



< 1 MS

low latency



adhoc queries

monthly active users relevance for ads

ad impressions count hash tag trends

deterministic workflows

fanout Tweets search for Tweets

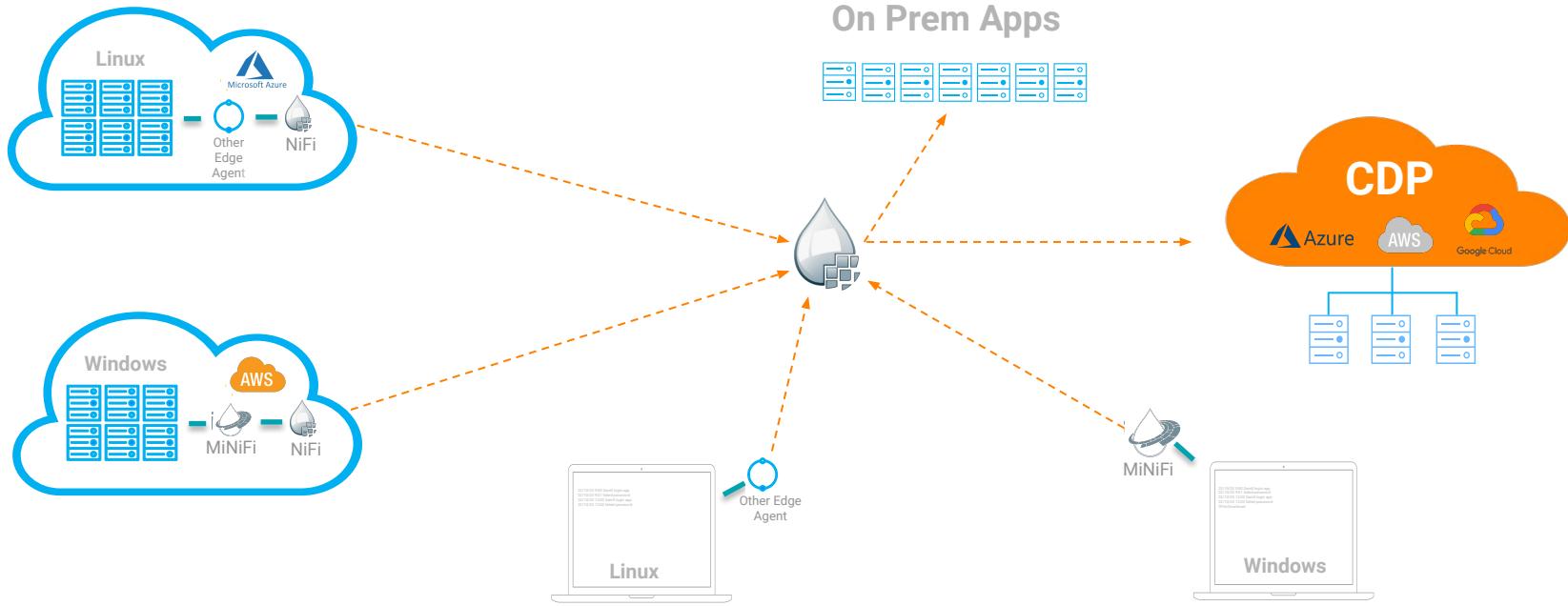
Financial Trading

BUILDING REAL-TIME REQUIRES A TEAM



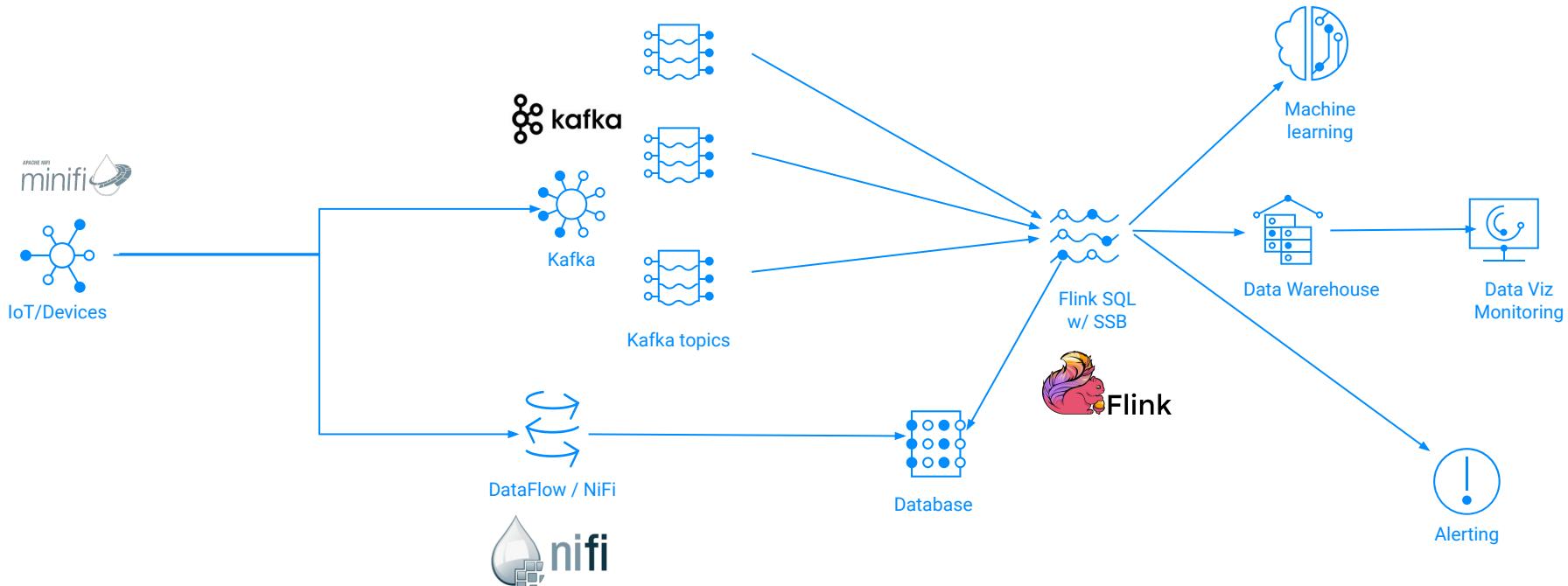
DISTRIBUTE DATA COLLECTION AND PROCESSING ACROSS PLATFORMS

Cloudera Edge Management and Cloudera Flow Management



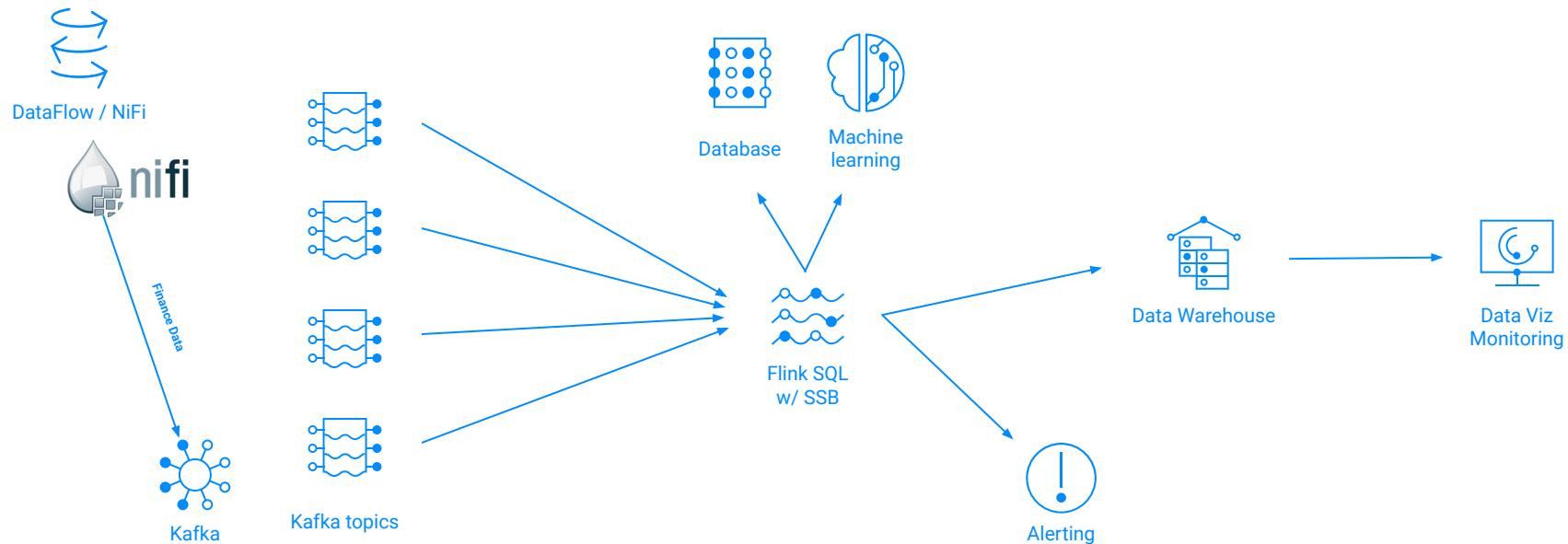
Architecture in the context of IoT (ATM, ...)

Apache MiNiFi, NiFi, Kafka & Flink (Flink SQL with Stream SQL Builder)



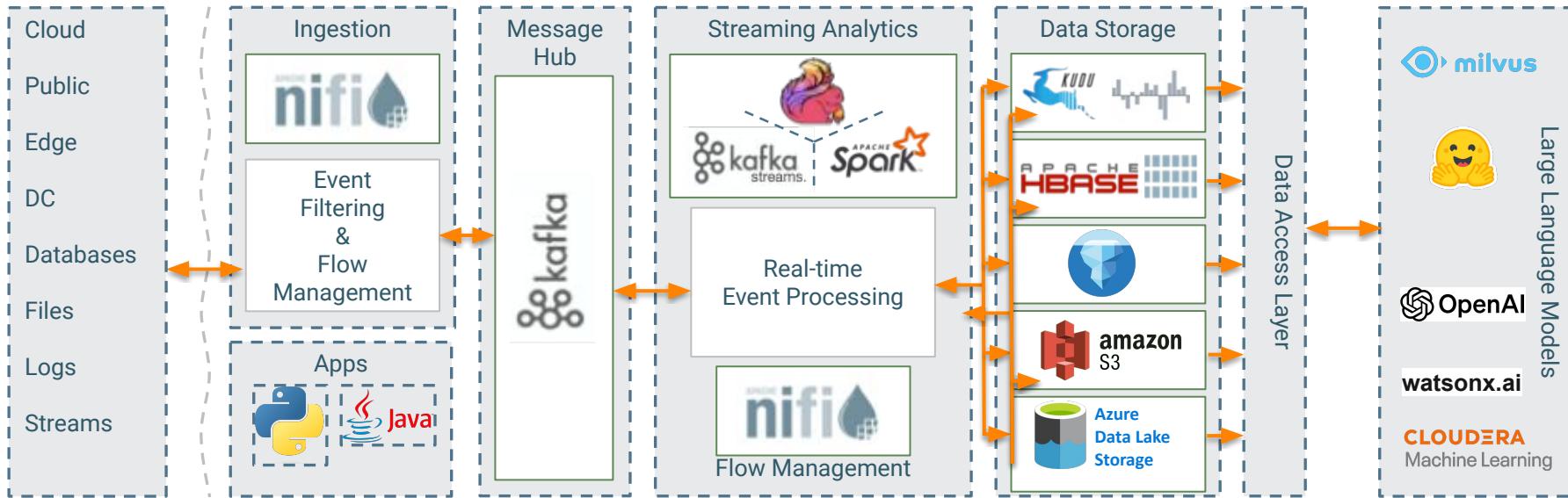
Architecture in the context of Financial Use Cases

Kafka & Flink (Flink SQL with Stream SQL Builder) for real time analytics



Financial Data Collection, Storage and Analytics

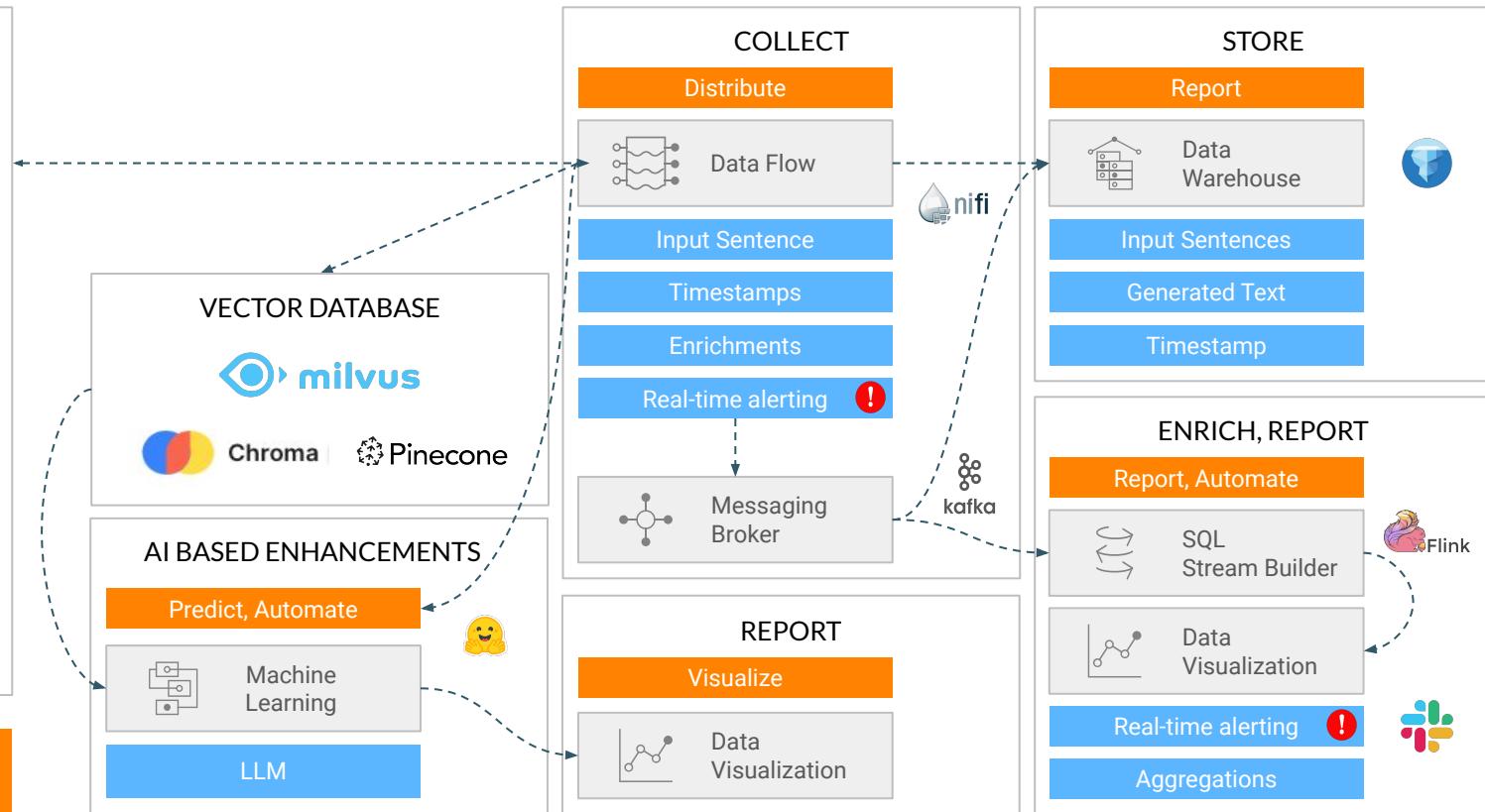
Collecting data from any source, any size, any scale



INTERACT

- Live Q&A
 - Travel Advisories
 - Weather Reports
 - Documents
 - Social Media
 - Databases
 - Transactions
 - Public Data Feeds
 - S3 / Files
 - Logs
 - ATM Data
 - Live Chat
 - ...
- Collect

HYBRID CLOUD



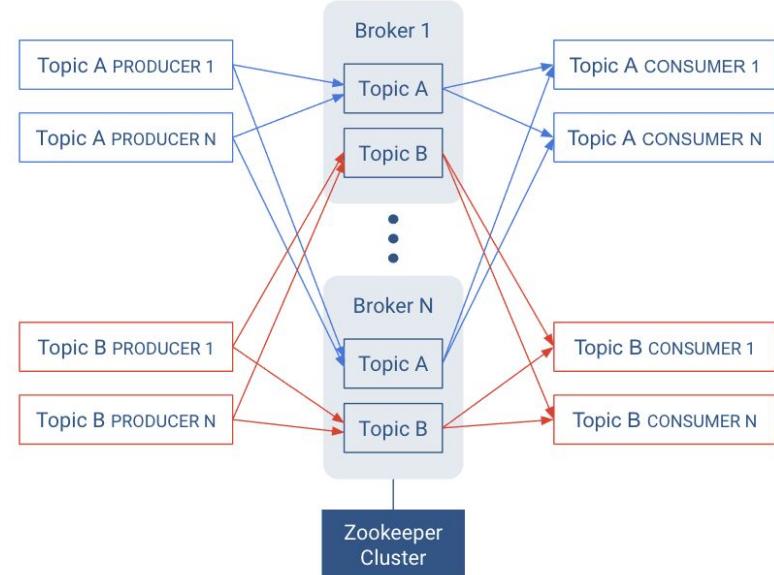
APACHE KAFKA

STREAMS MESSAGING WITH KAFKA



| WriteToKafka | | PublishKafka2RecordCDP 1.0.0.2.2.2.0-127 com.cloudera - nifi-cdf-kafka-2-nar |
|--------------|-------------------|---|
| In | 0 (0 bytes) | 5 min |
| Read/Write | 0 bytes / 0 bytes | 5 min |
| Out | 0 (0 bytes) | 5 min |
| Tasks/Time | 0 / 00:00:00.000 | 5 min |

- Highly reliable distributed messaging system.
- Decouple applications, enables many-to-many patterns.
- Publish-Subscribe semantics.
- Horizontal scalability.
- Efficient implementation to operate at speed with big data volumes.
- Organized by topic to support several use cases.

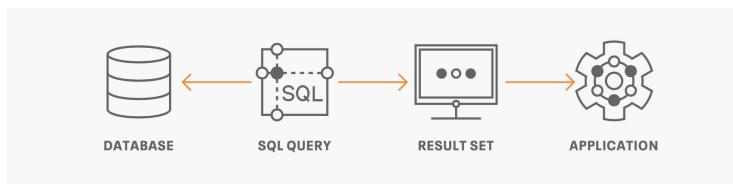


APACHE FLINK

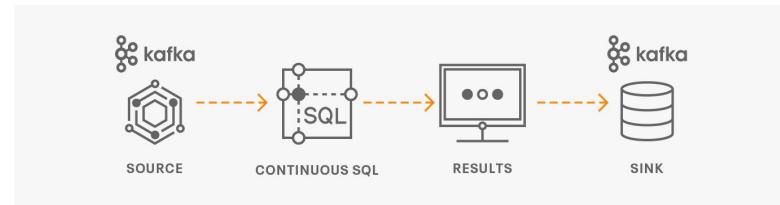
CONTINUOUS SQL

- SSB is a Continuous SQL engine
- It's SQL, but a slightly different mental model, but with big implications

Traditional Parse/Execute/Fetch model



Continuous SQL Model



Hint: The query is boundless and never finishes, and time matters

AKA: `SELECT * FROM foo WHERE 1=0 -- will run forever`

SQL STREAM BUILDER (SSB)

Democratize access to real-time data with just SQL

SQL STREAM BUILDER allows developers, analysts, and data scientists to **write streaming applications** with industry standard **SQL**.

No Java or Scala code development required.

Simplifies access to data in Kafka & Flink. Connectors to batch data in HDFS, Kudu, Hive, S3, JDBC, CDC and more

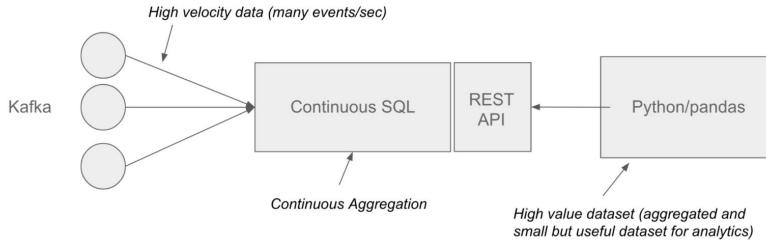
Enrich streaming data with batch data in a single tool

```
CREATE TABLE `kafka_table_1670513700` (
  `col_id` INT,
  `col_str` STRING,
  `col_ts` TIMESTAMP(3),
  WATERMARK FOR `col_ts` AS `col_ts` - INTERVAL '5' SECOND
) WITH (
  'connector' = 'kafka',
  'topic' = 'yourTopicName',
  'bootstrap.servers' = '...', -- Comma separated list of Kafka brokers,
  'key.ignore' = 'true', -- To read record from where the table is used as source. It also supports topic list for source by separating topic by semicolon,
  'value.ignore' = 'true', -- To read record from where the table is used as sink. Note, only one of 'topic-pattern' and 'topic' can be specified for sources. When the table is used as sink, the topic name is the topic to write data to. Note topic list is not supported for sinks,
  'json-decode-decimals-as-plain-number' = 'false' -- Optional flag to specify whether to encode all decimals as plain numbers instead of parsing them as floating point numbers by default,
  'topic' = '...', -- To read record from where the table is used as source. It also supports topic list for source by separating topic by semicolon,
  'bootstrap.servers' = '...', -- Comma separated list of Kafka brokers,
  'key.ignore' = 'true', -- To read record from where the table is used as sink. Note, only one of 'topic-pattern' and 'topic' can be specified for sinks,
  'value.ignore' = 'true', -- To read record from where the table is used as sink. Note, only one of 'topic-pattern' and 'topic' can be specified for sinks,
  'topic' = '...', -- Optional flag to specify whether to fail if a field is missing or not, false by default,
  'ignore-parse-error' = 'true', -- Optional flag to skip fields and rows with parse errors instead of failing; fields are set to null in case of errors, false by default,
  'map-null-key-literal' = 'null' -- Optional flag to specify string literal for null keys when 'map-null-key-mode' is LITERAL, '\"null\"' by default or '\"map-null-key-mode' = 'FAIL' -- Optional flag to control the handling mode when serializing null key for map data, FAIL by default,
  'option.GROUP' will drop null key entries for map data. Option LITERAL will use 'map-null-key.literal' as key literal.
)
  
```

Logs Results Events

SSB MATERIALIZED VIEWS

Key Takeaway; MV's allow data scientist, analyst and developers consume data from the firehose

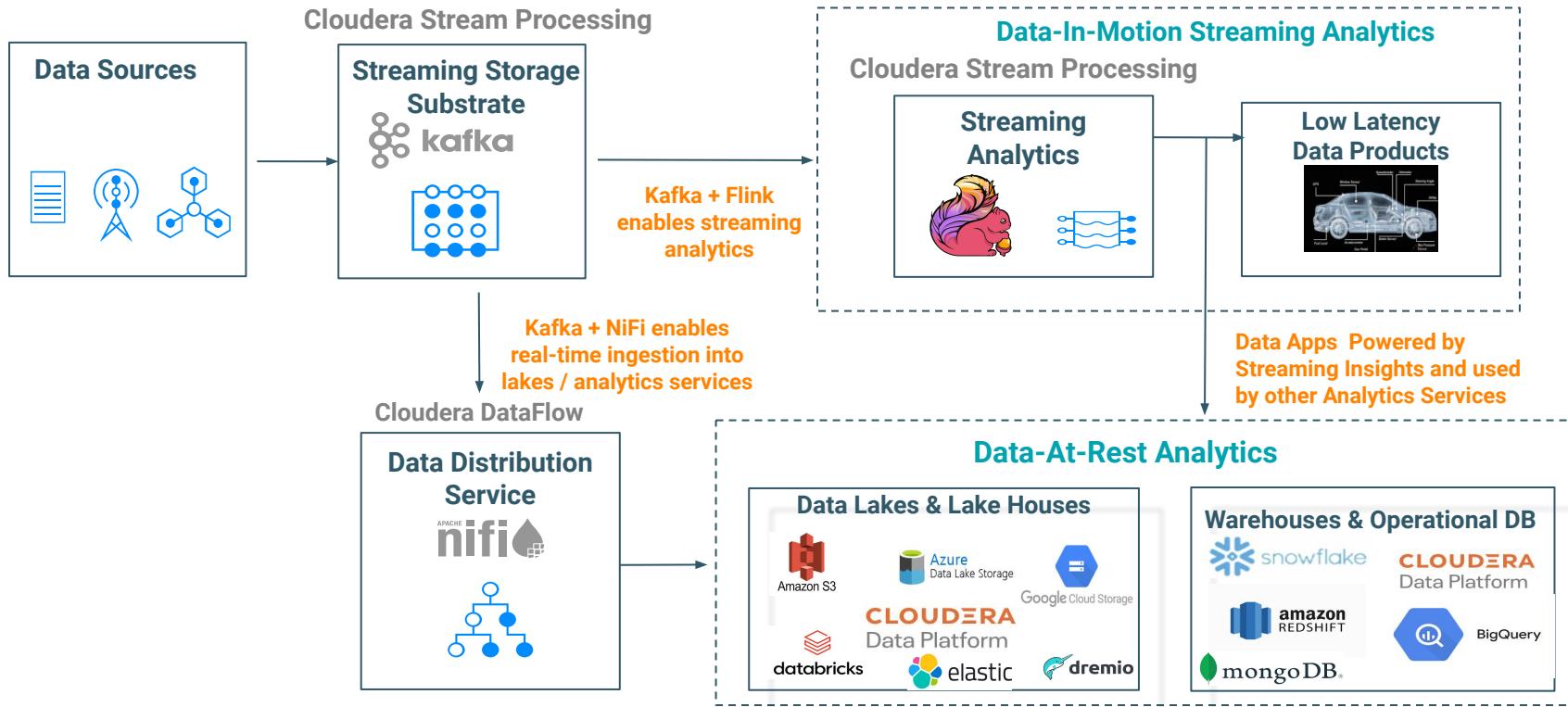


```
SELECT userid,
       max(amount) as max_amount,
       sum(amount) as sum_amount,
       count(*) as thecount,
       tumble_end(eventTimestamp, interval '5' second) as ts
  FROM authorizations
 GROUP BY userid, tumble(eventTimestamp, interval '5' second)
 HAVING count(*) > 1
```



```
[90]: import pandas as pd
[91]: mv = "https://xxxxxxxxxx"
[92]: df = pd.read_json(mv)
[93]: len(df.keys())
[93]: 5
[95]: df['ts'] = pd.to_datetime(df['ts'])
[97]: df.dtypes
[97]: max_amount          int64
       sum_amount          int64
       thecount            int64
       ts                  datetime64[ns]
       userid              int64
       dtype: object
[98]: df.set_index('userid').sort_values(by=['thecount'], ascending=False).head()
[98]:
      max_amount  sum_amount  thecount      ts
userid
    787      34911     57304     10 2020-06-16 19:52:15
    744      77407     95407      9 2020-06-16 19:52:15
    78      88761     330397      9 2020-06-16 19:52:15
    541      78762     282682      8 2020-06-16 19:52:15
    926      85636     129728      8 2020-06-16 19:52:15
```

Moving Beyond Draining of Streams Into Lakes: Analytics-in-Stream



DATAFLOW APACHE NIFI

Apache NiFi - developed 17 years ago by the NSA



2006

NiagaraFiles (NiFi) was first incepted at the National Security Agency (NSA)



November 2014

NiFi is donated to the Apache Software Foundation (ASF) through NSA's Technology Transfer Program and enters ASF's incubator.



July 2015

NiFi reaches ASF top-level project status

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)

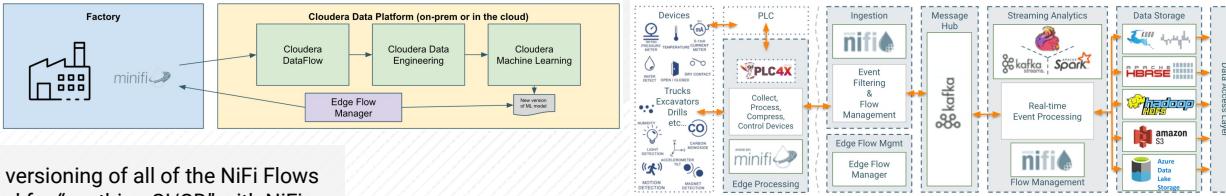
14M+ docker pulls of the Apache NiFi image (1M+ - 4 years ago)



Able to manage and control millions of MiNiFi Agents. Support edge deployments as well as k8s based deployments for large scale parallel processing with headless version of NiFi.

In Google, type “Youtube Cloudera Edge Management”

<https://www.youtube.com/playlist?list=PLe-h9HrA9qfDmRqy7I3LxPEIGjdF>



Manages versioning of all of the NiFi Flows and is used for “anything CI/CD” with NiFi

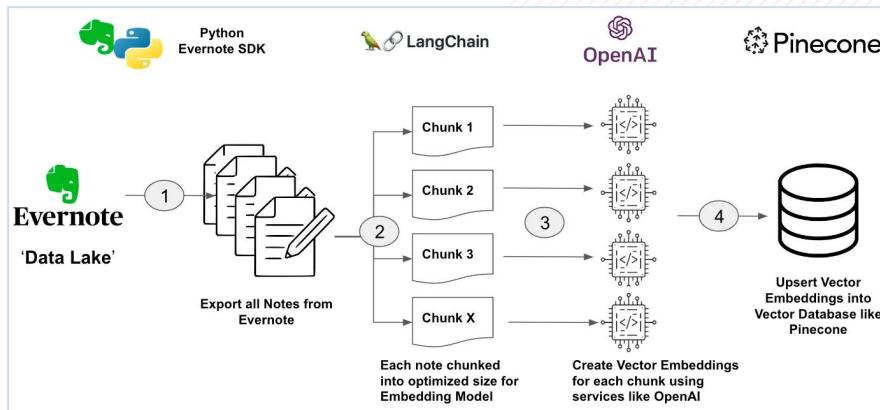
Converts any flow (where destination or source is Kafka) into a Kafka Connect connector

To run NiFi Flows in a serverless way in AWS Lambda, Azure Functions and Google Cloud Functions
Perfect for: processing files as they’re landing in the object store, cron-driven jobs, API exposed with NiFi

Cloudera’s offering to run NiFi on k8s in the cloud and on-prem (BYOK8s)

NiFi 2.0 is coming... <https://medium.com/cloudera-inc/getting-ready-for-apache-nifi-2-0-5a5e6a67f450>

- First-class citizen Python API
- Rules Engine
- NiFi Stateless at Process Group level
- Java 21 (virtual threads, perf improvements, etc)



Closing the gap between data engineers and data scientists...

- Export documentation (Sharepoint, OCR) to build the knowledge base powering your chatbot
- Scrape the internet (Sitemap) to build the knowledge base powering your chatbot
- Real-time streaming ingest of Slack to build the knowledge base powering your chatbot

Evernote AI Chatbot Powered by Apache NiFi using OpenAI, Pinecone & Langchain

The screenshot shows a conversation between a user and a chatbot:

- User: When did my right elbow pain occur? (Smiley face)
- Bot: The right elbow pain occurred on January 11, 2023. (Smiley face)
- User: Evernote Source: Note: Right Elbow Pain - 01-11-23 (Notebook: Family_Aju_Health),
- User: What doctor did I see for it? (Smiley face)
- Bot: You saw Dr. Patel for your right elbow pain. (Smiley face)
- User: Evernote Source: Note: Appointment with Dr. Patel on 6_20 for Right Elbow Pain (Notebook: Family_Aju_Health),
- User: What was the cause for the right elbow pain and what did the doctor suggest? (Smiley face)
- Bot: The cause for the right elbow pain is tennis elbow. The doctor suggested a cortisone shot in the right elbow and taking Diclofenac for prescription pain relief. (Smiley face)
- User: Evernote Source: Note: Appointment with Dr. Patel on 6_20 for Right Elbow Pain (Notebook: Family_Aju_Health), Note: Right Elbow Pain - 01-11-23 (Notebook: Family_Aju_Health),
- User: What was the dosage for Diclofenac? (Smiley face)
- Bot: The dosage for Diclofenac is 50 mg, 3 times a week. (Smiley face)
- User: Evernote Source: Note: Medications & Prescriptions That I Take (Notebook: Family_Aju_Health),
- User: You: (Text input field)
- User: Send (Send button)

<https://medium.com/@george.vetticaden/accelerating-ai-data-pipelines-building-an-evernote-chatbot-with-apache-nifi-2-0-and-generative-ai-9d977466ff4c>

PROVENANCE

Displaying 13 of 104
Oldest event available: 11/15/2016 13:34:50 EST

Showing the most recent events.

ConsumeKafka by component name

| Date/Time | Type | FlowFile Uuid | Size | Component Name | Component Type |
|--------------------------|---------|-------------------------------|----------|----------------|----------------|
| 11/15/2016 13:35:03.8... | RECEIVE | 379fc4f6-60e0-4151-9743-28... | 44 bytes | ConsumeKafka | ConsumeKafka |
| 11/15/2016 13:35:02.7... | RECEIVE | 78f8c38b-89fc-4d00-a8d8-51... | 44 bytes | ConsumeKafka | ConsumeKafka |
| 11/15/2016 13:35:01.6... | RECEIVE | 2bcd5124-bb78-489f-ad8a-7... | 44 bytes | ConsumeKafka | ConsumeKafka |

• Tracks data at each point as it flows through the system

• Records, indexes, and makes events available for display

• Handles fan-in/fan-out, i.e. merging and splitting data

• View attributes and content at given points in time

The diagram illustrates a data flow process. It starts with a red circle labeled "RECEIVE", which has an arrow pointing down to a grey circle labeled "JOIN". From the "JOIN" circle, an arrow points down to a grey circle labeled "DROP". Two green arrows originate from the "RECEIVE" and "JOIN" circles and point to a separate window titled "Provenance Event".

Provenance Event

DETAILS ATTRIBUTES CONTENT

Attribute Values

| | |
|-----------------|---|
| filename | 328717796819631 |
| kafka.offset | 44815 |
| kafka.partition | 6 |
| kafka.topic | nifi-testing |
| path | / |
| uuid | 328717796819631-0000-0000-0000-000000000000 |

RECORD-ORIENTED DATA WITH NIFI

- **Record Readers** - Avro, CSV, Grok, IPFIX, JSON1, JSON, Parquet, Scripted, Syslog5424, Syslog, WindowsEvent, XML
- **Record Writers** - Avro, CSV, FreeFromText, Json, Parquet, Scripted, XML
- Record Reader and Writer support referencing a schema registry for retrieving schemas when necessary.
- Enable processors that accept any data format without having to worry about the parsing and serialization logic.
- Allows us to keep FlowFiles larger, each consisting of multiple records, which results in far better performance.

| Filter Events | |
|---|-------------------------|
| QueryRecord 1.13.2.2.2.2.0-127 org.apache.nifi - nifi-standard-nar | |
| In | 0 (0 bytes) 5 min |
| Read/Write | 0 bytes / 0 bytes 5 min |
| Out | 0 (0 bytes) 5 min |
| Tasks/Time | 0 / 00:00:00.000 5 min |

Configure Processor

SETTINGS SCHEDULING PROPERTIES COMMENTS

Required field

| Property | Value |
|---------------|---------------------|
| Record Reader | CSVReader |
| Record Writer | JsonRecordSetWriter |

+

RUNNING SQL ON FLOWFILES

- Evaluates one or more SQL queries against the contents of a FlowFile.
- This can be used, for example, for field-specific filtering, transformation, and row-level filtering.
- Columns can be renamed, simple calculations and aggregations performed.
- The SQL statement must be valid ANSI SQL and is powered by Apache Calcite.

| Filter Events | | |
|---|-------------------|-------|
| QueryRecord 1.13.2.2.2.2.0-127 org.apache.nifi - nifi-standard-nar | | |
| In | 0 (0 bytes) | 5 min |
| Read/Write | 0 bytes / 0 bytes | 5 min |
| Out | 0 (0 bytes) | 5 min |
| Tasks/Time | 0 / 00:00:00.000 | 5 min |

Configure Processor | QueryRecord 1.13.2.2.2.2.0-127

Stopped

SETTINGS SCHEDULING PROPERTIES COMMENTS

Required field

| Property | Value |
|-------------------------------|-------------------------|
| Record Reader | Syslog_5424_Reader |
| Record Writer | JSON_Syslog_5424_Writer |
| Include Zero Record FlowFiles | false |
| Cache Schema | false |
| Default Decimal Precision | 10 |
| Default Decimal Scale | 0 |
| filtered_events | #(Filter Rule) |

FLOW CATALOG

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

The screenshot shows the Cloudera DataFlow interface with the 'Catalog' tab selected. The main area is titled 'Flow Catalog' and contains a table of flow definitions. A search bar at the top allows users to 'Search by name'. A blue button labeled 'Import Flow Definition' is located in the top right corner. The table has columns for Name, Type, Versions, and Last Updated. Each row includes a 'View' link represented by a right-pointing arrow. The table lists ten flow definitions:

| Name ↑ | Type | Versions | Last Updated | Action |
|--|------------------------|----------|--------------|--------|
| cc_fraud_template_int101run | Custom Flow Definition | 2 | a day ago | > |
| cc_fraud_template_int101run2 | Custom Flow Definition | 1 | 9 days ago | > |
| JSON_Kafka_To_Avro_S3 | Custom Flow Definition | 2 | a day ago | > |
| Kafka filter to Kafka | ReadyFlow | 1 | 2 days ago | > |
| Kafka to Cloudera Operational Database | ReadyFlow | 1 | 2 days ago | > |
| Kafka to S3 Avro | ReadyFlow | 1 | 14 hours ago | > |
| nifi_flows | Custom Flow Definition | 1 | 2 months ago | > |
| Weather Data Flow | Custom Flow Definition | 1 | a day ago | > |
| Weather_Data | Custom Flow Definition | 1 | 15 days ago | > |
| Weather_JSON_Kafka_To_Avro_S3 | Custom Flow Definition | 1 | 21 days ago | > |

At the bottom of the catalog page, there are pagination controls for 'Items per page' (set to 10), a page number '1 - 10 of 10', and navigation arrows.

DEPLOYMENT WIZARD

- Turns flow definitions into flow deployments
- Guides users through providing required configuration
- Choose NiFi runtime version
- Pick from pre-defined NiFi node sizes
- Define KPIs for the deployment

Start Deployment Wizard

dataflow-demo-new / New Flow Deployment

Overview

Selected Flow Definition

| | | | |
|------|---------------------------|---------|---|
| NAME | Machine Data To Warehouse | VERSION | 3 |
|------|---------------------------|---------|---|

Target Environment

| | |
|------|-------------------|
| NAME | dataflow-demo-new |
|------|-------------------|

NiFi Runtime Version

| | | |
|-----------------|-----------------------------------|----------------|
| CURRENT VERSION | Latest Version (1.14.0.2.3.1.0-3) | Change Version |
|-----------------|-----------------------------------|----------------|

Deployment Name

Configure Sizing & Scaling

Overview

Flow Parameters

Sizing & Scaling

Key Performance Indicators

Review

Sizing & Scaling

Select the NiFi node size and the number of nodes provisioned for your flow.

NiFi Node Sizing

| | | | |
|--|------------------------------------|-------------------------------------|--------------------------------------|
| <input checked="" type="radio"/> Extra Small | <input type="radio"/> Small | <input type="radio"/> Medium | <input type="radio"/> Large |
| 2 vCores Per Node 4 GB Per Node | 4 vCores Per Node 8 GB Per Node | 8 vCores Per Node 16 GB Per Node | 16 vCores Per Node 32 GB Per Node |

Number of NiFi Nodes

Auto Scaling

Enabled

Min. Nodes: 1

Max. Nodes: 3

Provide Parameters

Flow Parameters

Data entered here never leaves the environment in your cloud account. Provide parameter values directly in the text input or upload a file for parameters that expect a file.

MachineData

AWS Credential File

Select File

Drop file or browse

CDP Truststore

Enter parameter values.

Select File

Drop file or browse

CDPSchemaRegistry

https://dataflow-streams-master0.dataflow.xcu2-8y8x.dev.cldr.work:7790/api/v1

Define KPIs

Key Performance Indicators

Set up KPIs to track specific performance metrics of a deployed flow. Click and drag to reorder how they are displayed.

Entire Flow

METRIC TO TRACK: Data In

ALERT SET: Notify if less than 150 KB/sec, for at least 30 seconds.

Processor: Write to S3 using HDFS proc

METRIC TO TRACK: Bytes Sent

ALERT SET: No alert set

Add New KPI

KEY PERFORMANCE INDICATORS

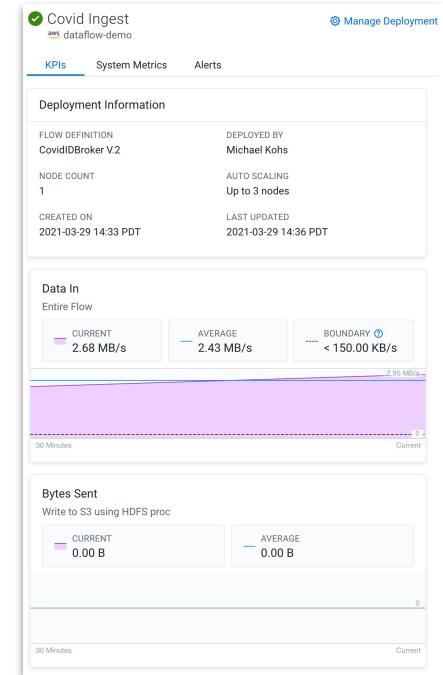
- Visibility into flow deployments
- Track high level flow performance
- Track in-depth NiFi component metrics
- Defined in Deployment Wizard
- Monitoring & Alerts in Deployment Details

KPI Definition in Deployment Wizard

The screenshot shows the 'New Deployment' step of the deployment wizard. On the left, a sidebar lists steps: Overview, NiFi Configuration, Parameters, Sizing & Scaling, Key Performance Indicators (selected), and Review. The main area is titled 'Key Performance Indicators' with the sub-instruction 'Set up KPIs to track specific performance metrics of a deployed flow. Click and drag to reorder how they are displayed.' Below this is a 'Learn more' link. There are two sections for defining KPIs: 'Entire Flow' and 'Data Out'. Under 'Entire Flow', it says 'METRIC TO TRACK: Flow Files Queued' and 'ALERT SET: No alert set'. Under 'Data Out', it says 'METRIC TO TRACK: Data Out' and 'ALERT SET: Notify if outside the range of 999 MB/sec - 1 MB/sec, for at least 5 minutes.' At the bottom is a 'Add New KPI' button. To the right is a summary panel for the deployment:

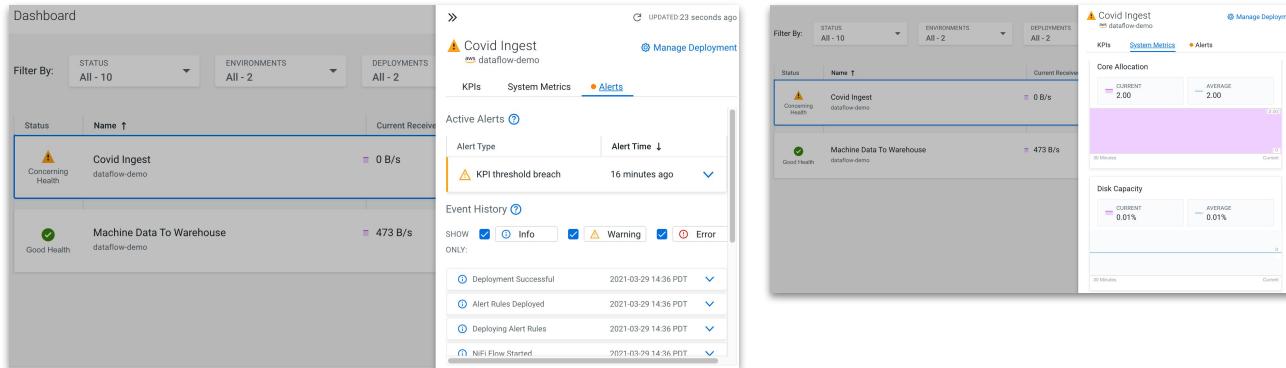
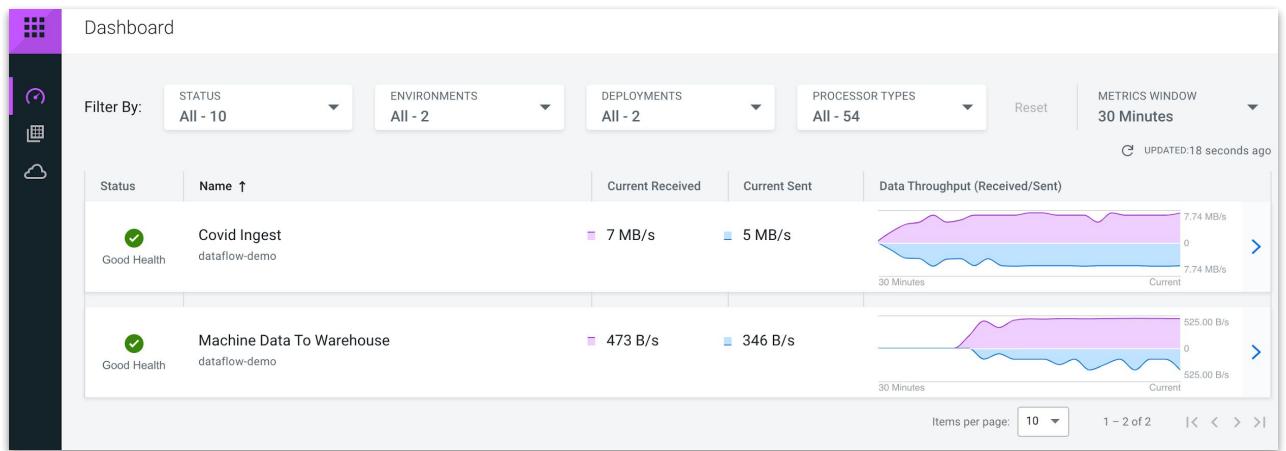
| | |
|--|-----------------------------------|
| FLOW DEFINITION | Hello World v1 |
| ENVIRONMENT DEPLOYING TO | se-sandboxx-aws |
| DEPLOYMENT NAME | abc_hello_world |
| NiFi Configuration | |
| NIFI RUNTIME VERSION | Latest Version (1.18.0.2.3.7.1-1) |
| AUTO-START FLOW | Yes |
| INBOUND CONNECTIONS | No |
| CUSTOM NAR CONFIGURATION | No |
| Parameters | |
| No parameters are available for this deployment. | |

KPI Monitoring



DASHBOARD

- Central Monitoring View
- Monitors flow deployments across CDP environments
- Monitors flow deployment health & performance
- Drill into flow deployment to monitor system metrics and deployment events



DEPLOYMENT MANAGER

- Manage flow deployment lifecycle
(Suspend/Start/Terminate)
- Add/Edit KPIs
- Change sizing configuration
- Update parameters
- Change NiFi version of the deployment
- Gateway to NiFi canvas

Dashboard / dataflow-demo-new / Kafka to COD

REFRESHED 12 seconds ago

Actions ▾

Deployment Manager

Status: Good Health

Deployment Name: Kafka to COD

Flow Definition: Kafka to Cloudera Operational Database V.1

Node Count: 1

Auto Scaling: Disabled

Created On: 2021-07-26 17:05 PDT

Region: US West (Oregon)

NIFI Runtime Version: 1.14.0.2.3.0.0-89

Deployed By: Michael Kohs

Last Updated: 2021-07-26 17:07 PDT

CN# cmcdp:df:us-west-1:9d74eee4-1cad-45d7-b645-7ccf9edb73d deploy...

Deployment Settings

KPIs and Alerts Sizing and Scaling Parameters

Parameters

Running Processors that are affected by the Parameter changes will automatically be restarted.

Data entered here never leaves the environment in your cloud account. Provide parameter values directly in the text input or upload a file for parameters that expect a file.

The selected flow definition references an external Default NiFi SSL Context Service. Hence, DataFlow will automatically create a matching SSL Context Service with a keystore and truststore generated from the target environment's FreeIPA certificate.

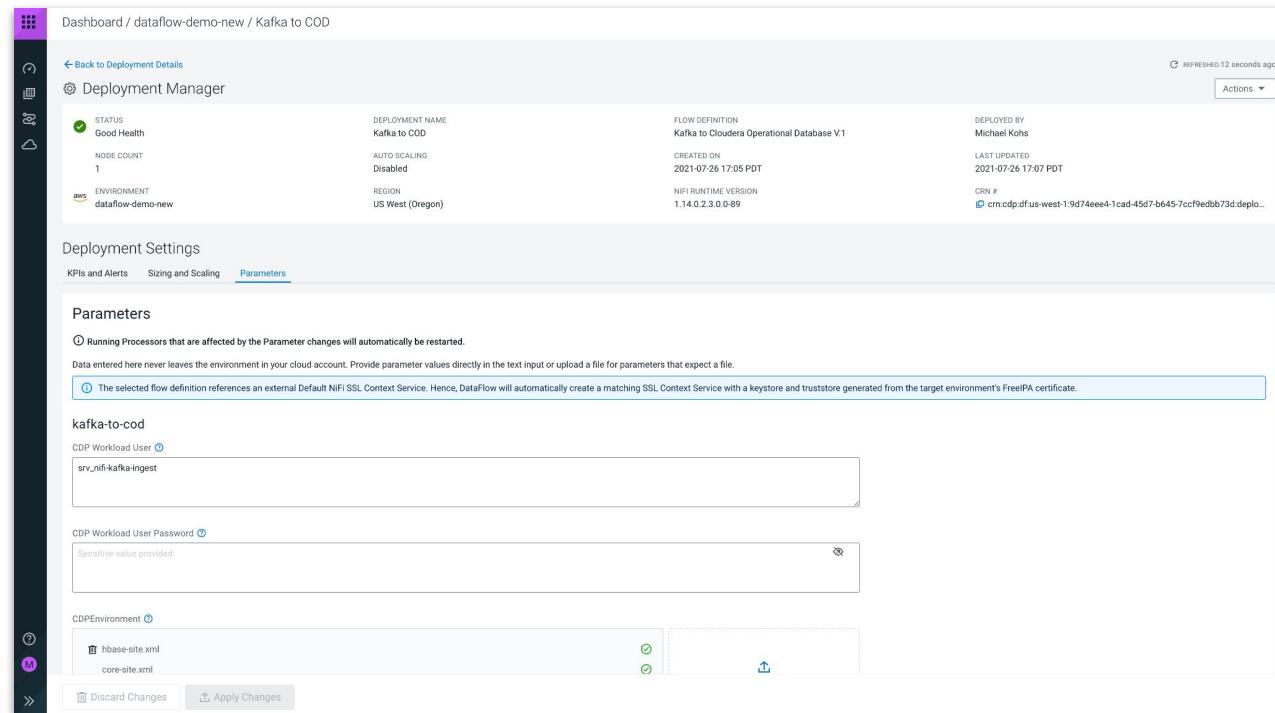
kafka-to-cod

CDP Workload User: srv_nifi-kafka-ingest

CDP Workload User Password: Sensitive value provided.

CDP Environment: hbase-site.xml core-site.xml

Discard Changes Apply Changes



OPEN DATA LAKEHOUSE

CLOUDERA CRITICAL DIFFERENTIATING CAPABILITIES



Pick the Right Engine for the Job:

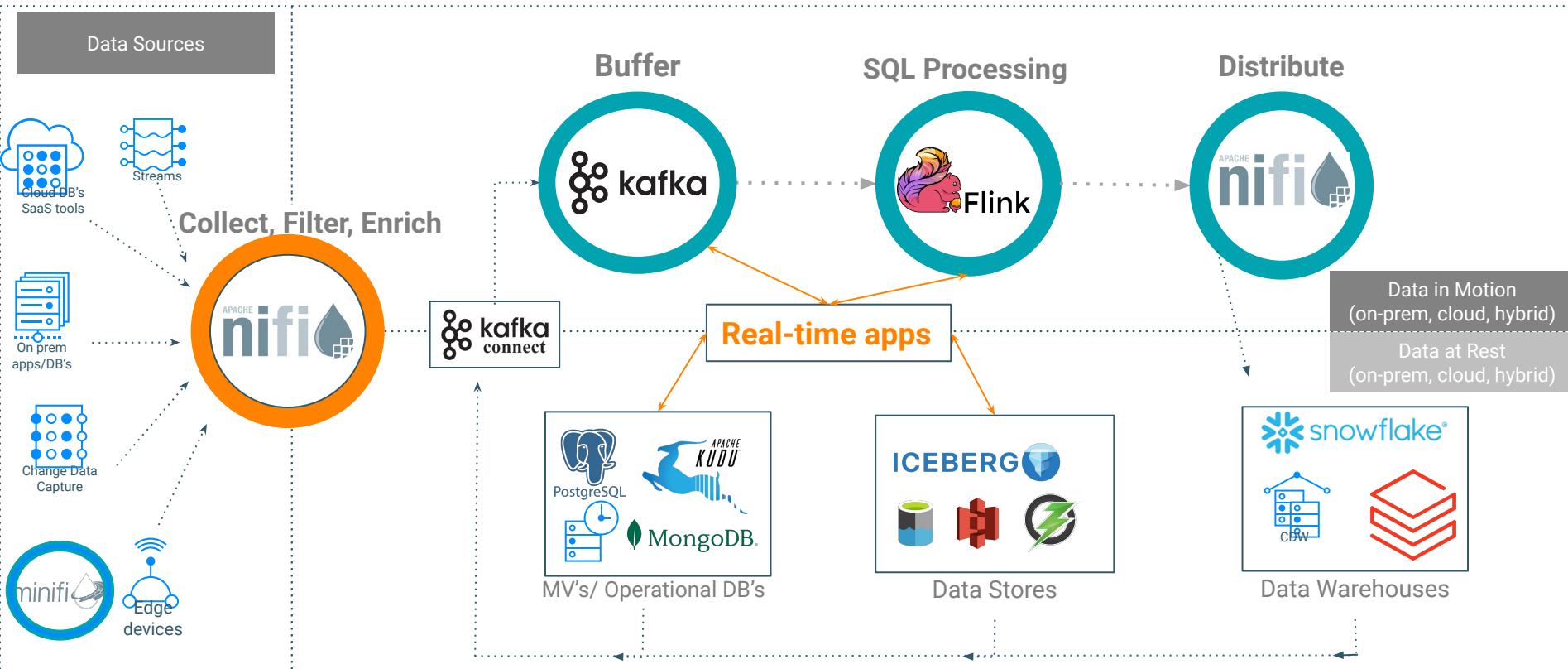
- Hybrid & edge data collection
- First class data distribution
- Democratization of stream processing
- Integration with data at rest
- Enterprise AI-readiness



Tooling & Platform Capabilities

- Simplified, open architecture
- Control of data pipelines as re-composable assets
- Developer productivity tooling and extensibility
- Decentralized access
- Centralized monitoring, security and governance

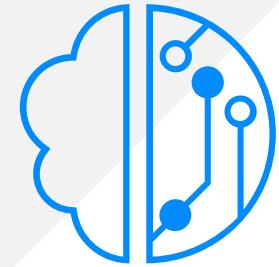
Cloudera Open Architecture for Data in Motion and Data at Rest



POWERED BY

CLOUDERA
SDX

Integrated Security, Governance and Observability for Cost-Effective Hybrid Deployments



NLP / AI / LLM

Cloudera + LLMs

LLM Serving
Serving Framework

LLM Fine Tuning Process
Training Framework

Vector DB

Data Preparation
Data Engineering

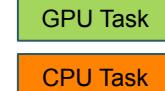
Knowledge Repository
Data Storage / Management



Streaming Classification
Real-Time Model Deployment



Key:



INGEST

Run collection and streaming on any cloud, server, container, bare metal, device or VM

Data Sources



OPENSIFT



amazon
web services

Microsoft Azure



Cloudera Data Flow



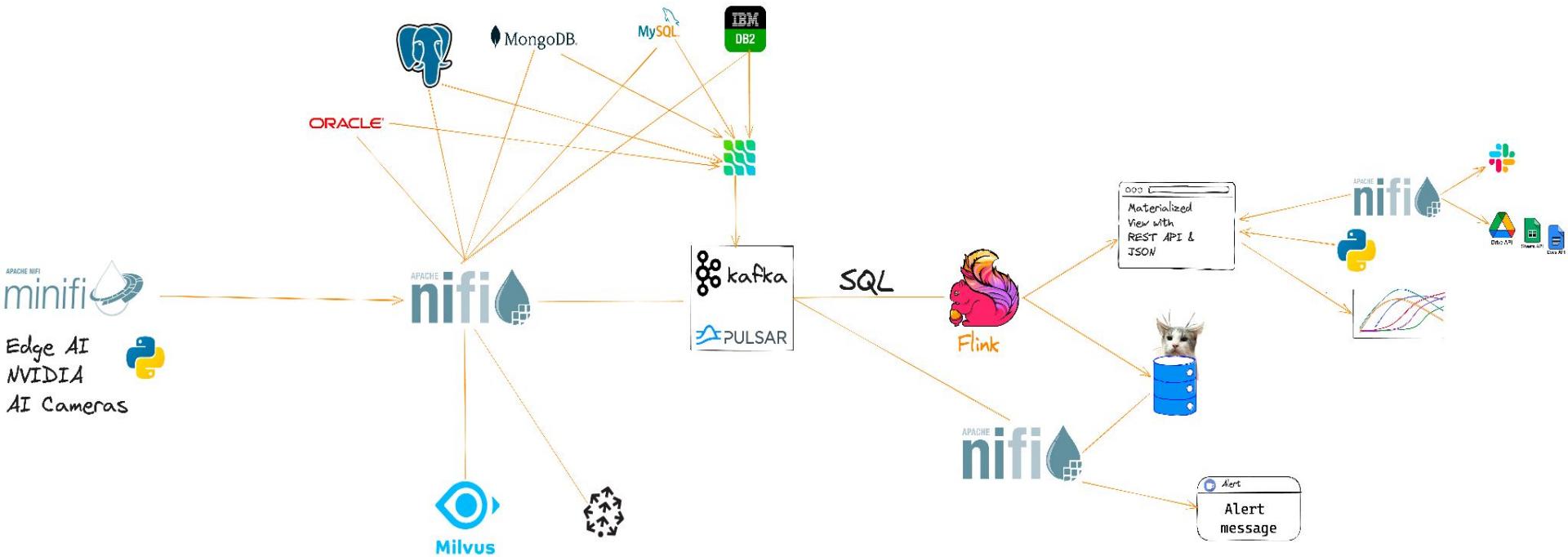
Cloudera Data Platform



Lake House

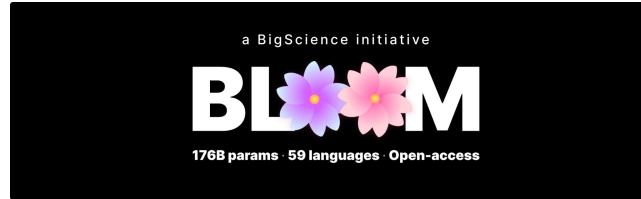


ENRICH



FUNNEL

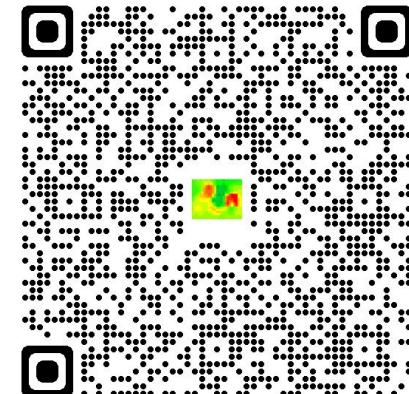
<https://github.com/tspannhw/FLaNK-HuggingFace-DistilBert-SentimentAnalysis>
<https://github.com/tspannhw/FLaNK-watsonx.ai>



watsonx.ai

CLOUDERA
Machine Learning

<https://github.com/tspannhw/FLaNK-LLM>

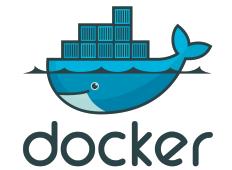


DISTRIBUTE

DEPLOY



<https://github.com/tspannhw/FLaNK-Edge-Models>



STORE



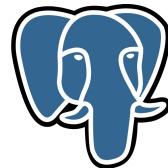
Milvus



Chroma



cassandra



ORACLE
DATABASE



Google
BigQuery



elasticsearch



APACHE
HBASE



redis



ICEBERG



IN THE CURRENT CML PRODUCT, YOU CAN ...



- Host and serve an **open source LLM**
- Create and host **enterprise ready applications** as front ends to these LLMs
- Instantiate a **vector database** to do semantic search on your enterprise knowledge base
- Provide enterprise specific context to an LLM to generate **factual responses**

All this **without** making any external calls to openAPI or any other SAAS AI service

DEMO

TH^ON^G Y^OU[★]

