Hail Hydrate! From Stream to Lake

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Developer Advocate

https://github.com/tspannhw/SpeakerProfile


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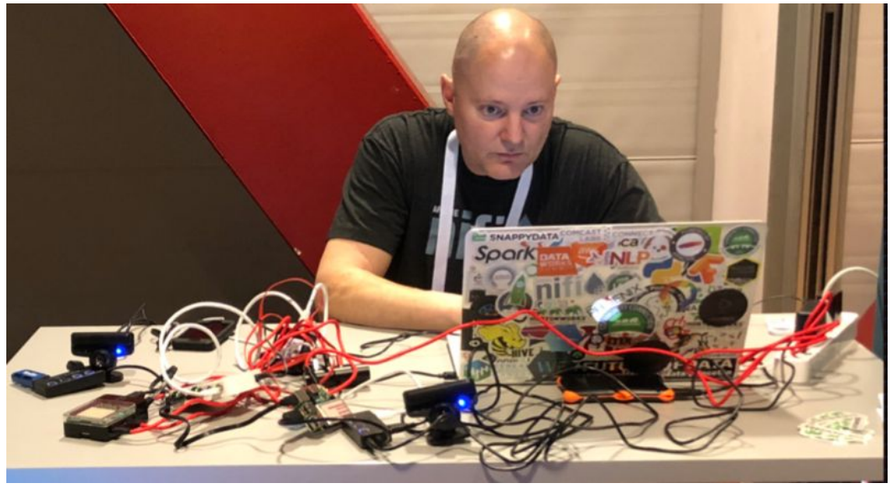
https://www.datainmotion.dev/

Speaker Bio

Developer Advocate



DZone Zone Leader and Big Data MVB;
@PaasDev

https://github.com/tspannhw https://www.datainmotion.dev/
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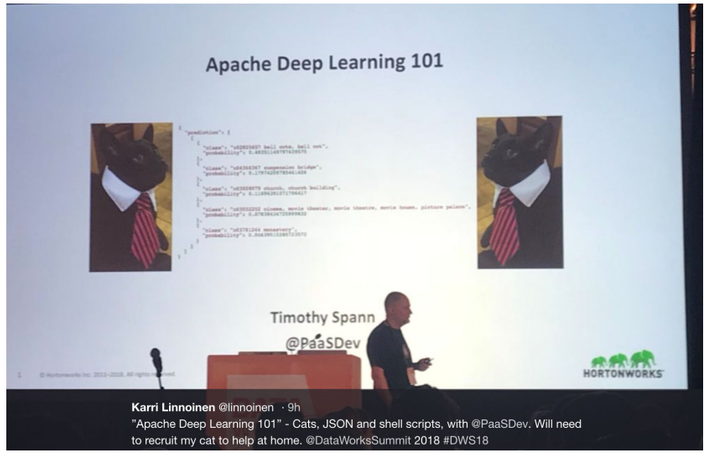
https://dev.to/tspannhw
https://sessionize.com/tspann/
https://www.slideshare.net/bunkertor



AGENDA

Use Case - Populate the Data Lake

Key Challenges

- Their Impact
- A Solution
- Outcome

Why Apache NiFi and Apache Pulsar?

Successful Architecture

Demo

Next Steps

USE CASE

IoT Ingestion: High-volume streaming sources, multiple message formats, diverse protocols and multi-vendor devices creates data ingestion challenges.

KEY CHALLENGES

Data Ingestion: High-volume streaming sources, multiple message formats, diverse protocols and multi-vendor devices creates data ingestion challenges.

Real-time Insights: Analyzing continuous and rapid inflow (velocity) of streaming data at high volumes creates major challenges for gaining real-time insights.

Visibility: Lack visibility of end-to-end streaming data flows, inability to troubleshoot bottlenecks, consumption patterns etc.

IMPACT

Code Sprawl: Custom scripts over various qualities proliferate across environments to cope with the complexity.

Costs: Increasing costs of development and maintenance. Too many tools, not enough experts, waiting for contractors or time delays as developers learn yet another tool, package or language.

Delays: Decreasing user satisfaction and delay in project delivery. Missed revenue and opportunities.

SOLUTION

Data Ingestion: Apache NiFi is the one tool handle high-volume streaming sources, multiple message formats, diverse protocols and multi-vendor devices.

Variety of Data: Apache NiFi offers hundreds of OOTB connectors and a GUI that accelerates flow developments. With Record Processors that convert types in a single fast step.

Visibility: Apache NiFi provenance provides insights, metrics and control over the entire end-to-end stream across clouds.

OUTCOME

New Applications: Enablement of new innovative use cases in compressed timeframe. No more waiting for data to arrive, Data Analysts and Data Scientists focus on innovation.

Savings: Cost reduction thanks to technologies offload, reduced consultant costs and simplification of ingest processes.

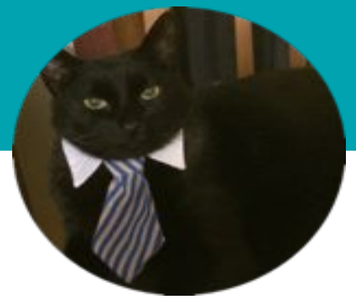
Agility: Reduction of new data source onboarding time from weeks to days. More data in your data warehouse now.

FLiP Stack for Cloud Data Engineers - ML

Multiple users, frameworks, languages, clouds, data sources & clusters

CLOUD DATA ENGINEER

- Experience in ETL/ELT
- Coding skills in Python or Java
- Knowledge of database query languages such as SQL
- Experience with Streaming
- Knowledge of Cloud Tools



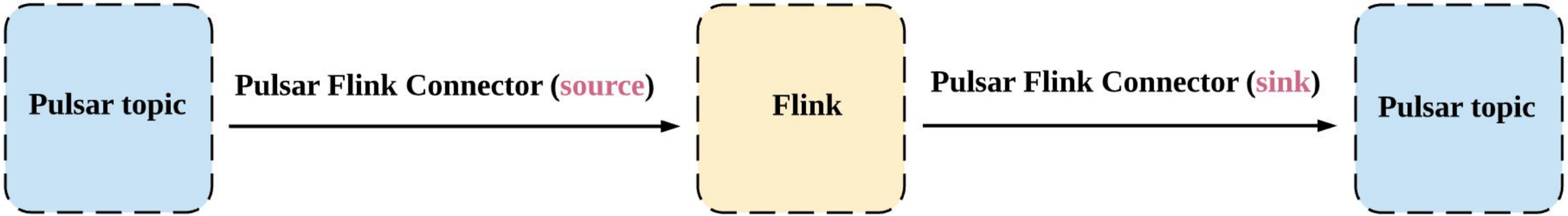
CAT

- Expert in ETL (Eating, Ties and Laziness)
- Edge Camera Interaction
- Typical User
- No Coding Skills
- Can use NiFi
- Questions your cloud spend

AI / Deep Learning / ML / DS

- Can run in Apache NiFi
- Can run in Apache Pulsar Functions
- Can run in Apache Flink
- Can run in Apache NiFi - MiNiFi Agents

FLiP Stack (FLink -integrate- Pulsar)



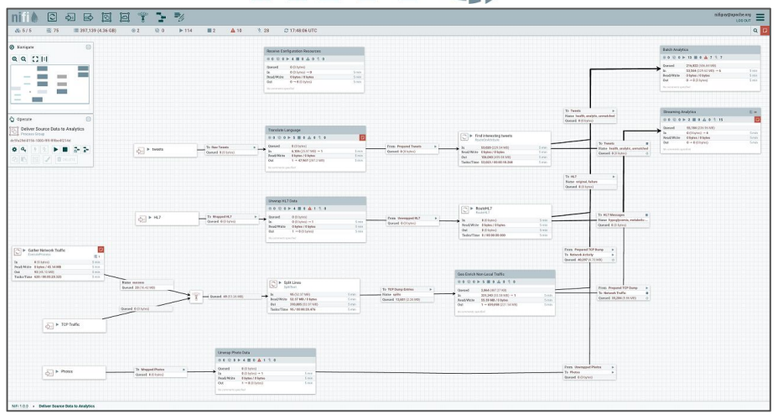
https://hub.streamnative.io/data-processing/pulsar-flink/2.7.0/

WHAT IS APACHE NIFI?

Apache NiFi is a scalable, real-time streaming data platform that collects, curates, and analyzes data so customers gain key insights for immediate actionable intelligence.

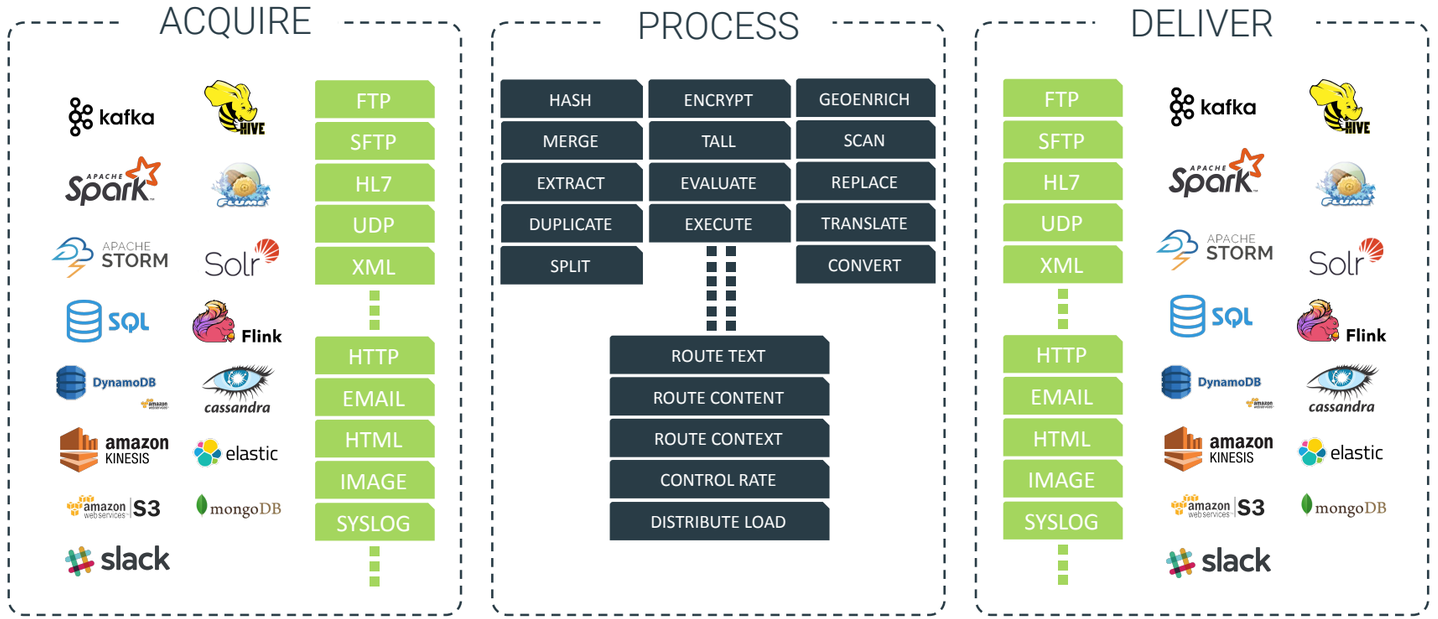
APACHE NIFI

Enable easy ingestion, routing, management and delivery of any data anywhere (Edge, cloud, data center) to any downstream system with built in end-to-end security and provenance



APACHE NIFI registry

Advanced tooling to industrialize flow development (Flow Development Life Cycle)

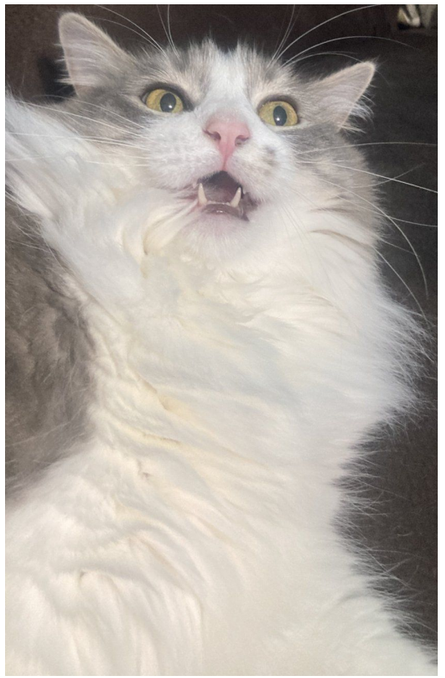


- Over 300 Prebuilt Processors
- Easy to build your own
- Parse, Enrich & Apply Schema
- Filter, Split, Merger & Route
- Throttle & Backpressure

- Guaranteed Delivery
- Full data provenance from acquisition to delivery
- Diverse, Non-Traditional Sources
- Eco-system integration

WHAT IS APACHE PULSAR?

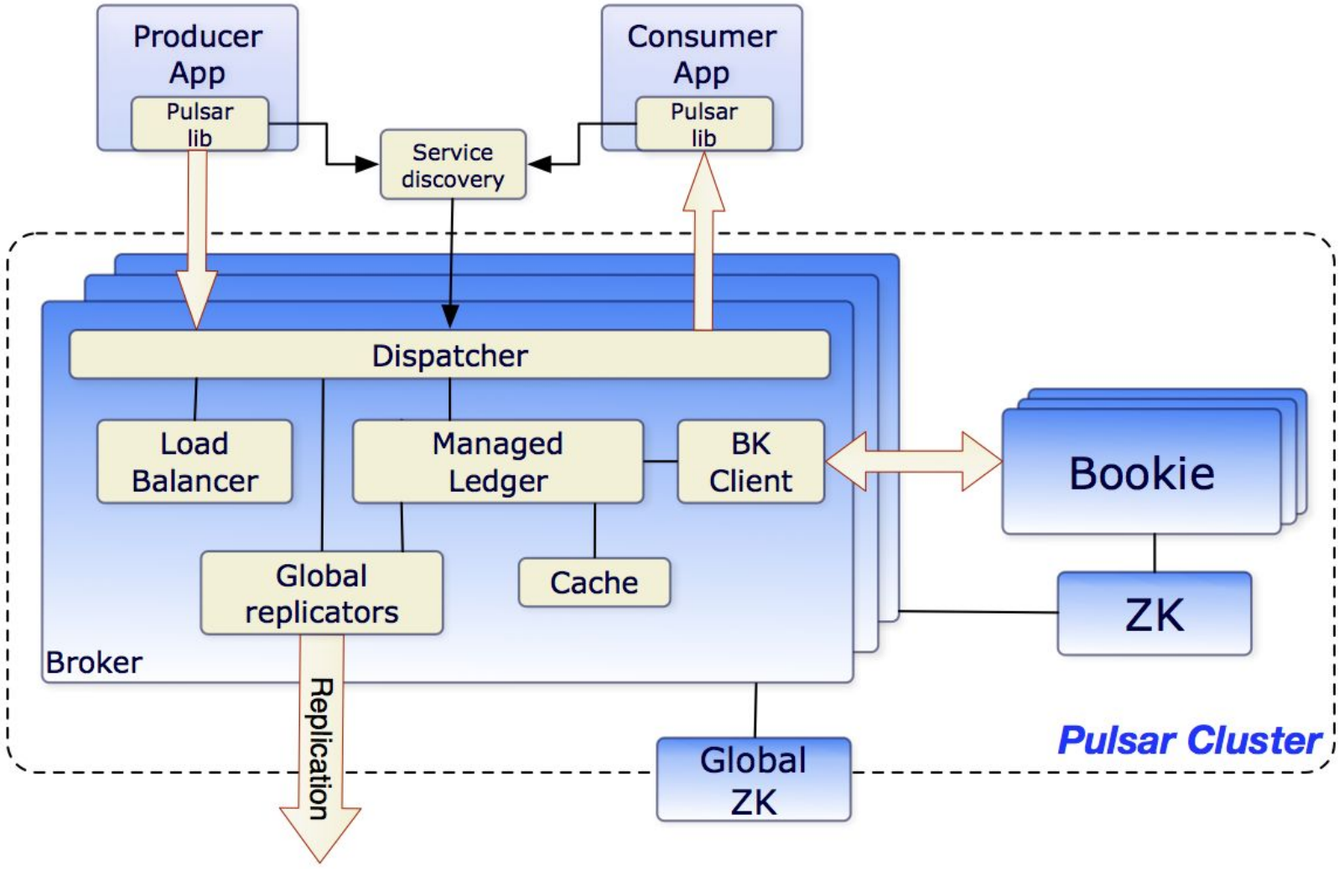
Apache Pulsar is an open source, cloud-native distributed messaging and streaming platform.



APACHE PULSAR

Enable Geo-Replicated Messaging

- Pub-Sub
- Geo-Replication
- Pulsar Functions
- Horizontal Scalability
- Multi-tenancy
- Tiered Persistent Storage
- Pulsar Connectors
- REST API
- CLI
- Many clients available
- Four Different Subscription Types
- Multi-Protocol Support
  - MQTT
  - AMQP
  - JMS
  - Kafka
  - ...



APACHE FLINK

3B+

3B+ data points daily streaming in from 25 million customers running real time machine learning prediction

USE CASE

Streaming real-time data pipelines that need to handle complex stream or batch data event processing, analytics, and/or support event-driven applications

TECHNOLOGY

Flink performs compute at in-memory speed at any scale

Flink parses SQL using Apache Calcite, which supports standard ANSI SQL

Flink runs standalone, on YARN, and has a K8s Operator

APPLICATION

Comcast a global media uses Flink for operationalizing machine learning models and near-real-time event stream processing

Flink helps deliver a personalized, contextual interaction reducing time to support resolutions saving millions of dollars per year

CONSIDERATION

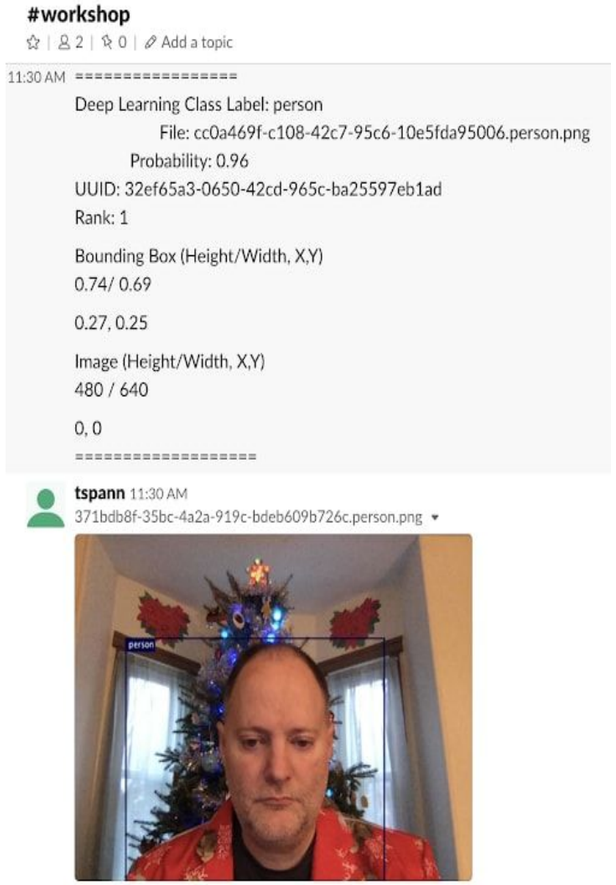
Data Freshness SLAs

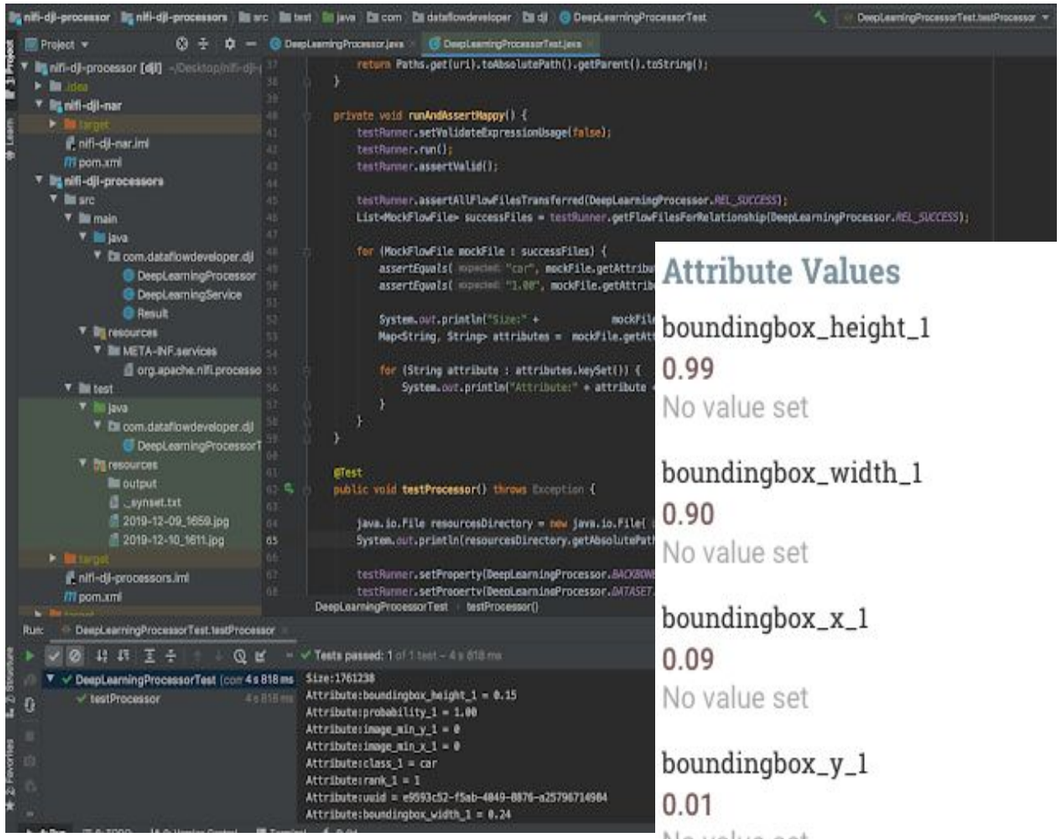
Flink can read and write from Hive data

Review requirements for fault tolerance, resilience, and HA

Apache MXNet Native Processor through DJL.AI for Apache NiFi

DJL





This processor uses the DJL.AI Java Interface

https://github.com/tspannhw/nifi-djl-processor

https://dev.to/tspannhw/easy-deep-learning-in-apache-nifi-with-djl-2d79

Apache MXNet Native Processor for Apache NiFi

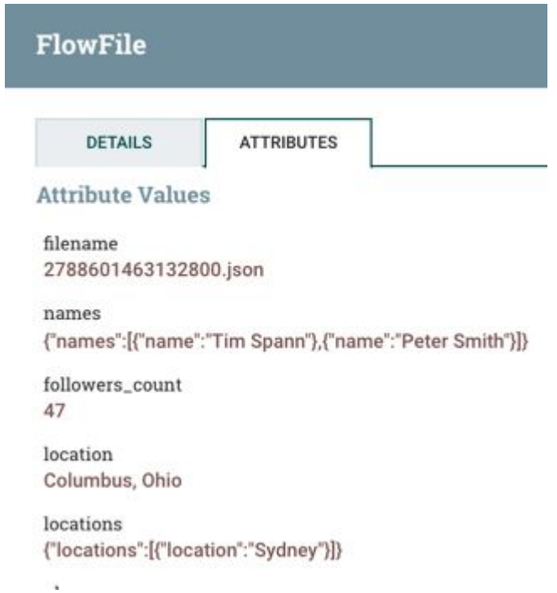
- https://www.slideshare.net/bunkertor/apache-deep-learning-101-apachecon-montreal-2018-v031
- https://www.slideshare.net/bunkertor/apache-deep-learning-202-washington-dc-dws-2019
- https://www.slideshare.net/bunkertor/apache-deep-learning-201-barcelona-dws-march-2019

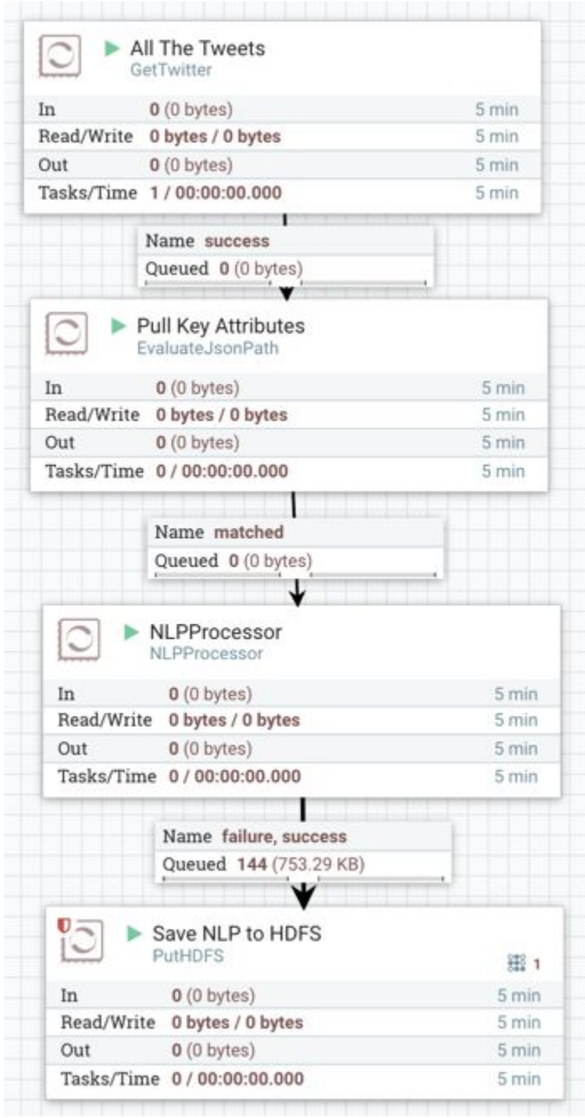
Apache OpenNLP with Apache NiFi

Apache OpenNLP for Entity Resolution Processor
https://github.com/tspannhw/nifi-nlp-processor

Requires installation of NAR and Apache OpenNLP Models (http://opennlp.sourceforge.net/models-1.5/).

This is a non-supported processor that I wrote and put into the community. You can write one too!

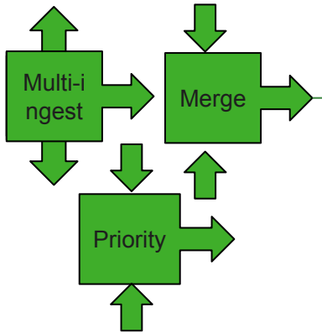


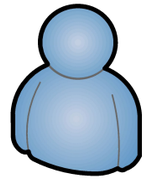


https://community.cloudera.com/t5/Community-Articles/Open-NLP-Example-Apache-NiFi-Processor/ta-p/249293

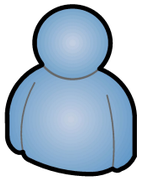
https://opennlp.apache.org/news/release-190.html

ALL DATA - ANYTIME - ANYWHERE - ANY CLOUD

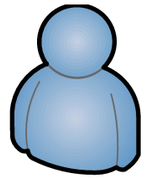




Data Analyst



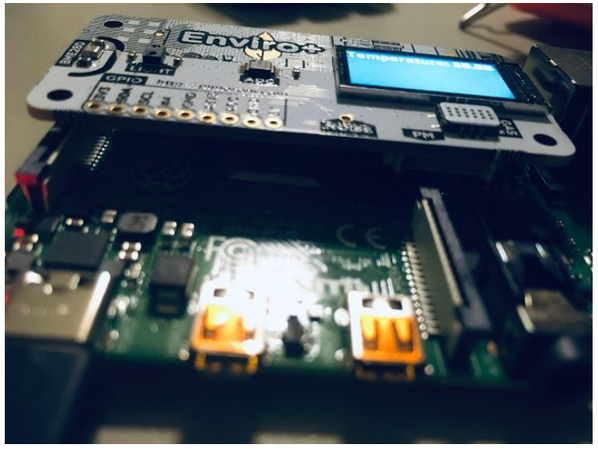
Data Analyst



Data Scientist

SHOW ME SOME DATA

{"uuid": "rpi4_uuid_jfx_20200826203733", "amplitude100": 1.2, "amplitude500": 0.6, "amplitude1000": 0.3, "lownoise": 0.6, "midnoise": 0.2, "highnoise": 0.2, "amps": 0.3, "ipaddress": "192.168.1.76", "host": "rp4", "host_name": "rp4", "macaddress": "6e:37:12:08:63:e1", "systemtime": "08/26/2020 16:37:34", "endtime": "1598474254.75", "runtime": "28179.03", "starttime": "08/26/2020 08:47:54", "cpu": 48.3, "cpu_temp": "72.0", "diskusage": "40219.3 MB", "memory": 24.3, "id": "20200826203733_28ce9520-6832-4f80-b17d-f36c21fd8fc9", "temperature": "47.2", "adjtemp": "35.8", "adjtempf": "76.4", "temperaturef": "97.0", "pressure": 1010.0, "humidity": 8.3, "lux": 67.4, "proximity": 0, "oxidising": 77.9, "reducing": 184.6, "nh3": 144.7, "gasKO": "Oxidising: 77913.04 Ohms\nReducing: 184625.00 Ohms\nNH3: 144651.47 Ohms"}



Weather Streaming Pipeline

Weather

location	observation_time	credit	credit_url	image
Abingdon, VA	Last Updated on Oct 27 2020, 11:55 am EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Ada, Ada Municipal Airport, OK	Last Updated on Oct 27 2020, 10:55 am CDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Adrian, Lenawee County Airport, MI	Last Updated on Oct 27 2020, 11:53 am EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Adrian, Lenawee County Airport, MI	Last Updated on Oct 27 2020, 12:53 pm EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Afton WY, WY	Last Updated on Oct 27 2020, 9:55 am MDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Aiken Municipal Airport, SC	Last Updated on Oct 27 2020, 11:55 am EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Ak-Chin Regional Airport, AZ	Last Updated on Oct 27 2020, 9:55 am MST	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Akron Canton Regional Airport, OH	Last Updated on Oct 27 2020, 12:51 pm EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Alabaster, Shelby County Airport, AL	Last Updated on Oct 27 2020, 10:53 am CDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Albert Whitted Airport, FL	Last Updated on Oct 27 2020, 12:53 pm EDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati
Albuquerque, Double Eagle II Airport, NM	Last Updated on Oct 27 2020, 10:55 am MDT	NOAA's National Weather Service	http://weather.gov/	MapRecord[{link=http://weather.gov, title=NOAA's Nati

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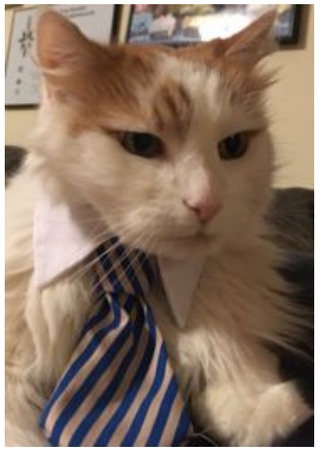
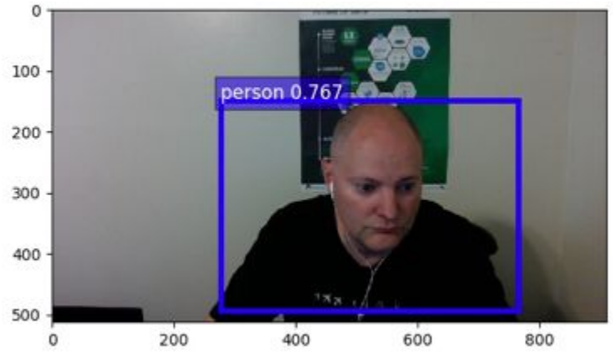


weather map



DEEPER CONTENT

- https://www.datainmotion.dev/2020/10/running-flink-sql-against-kafka-using.html
- https://www.datainmotion.dev/2020/10/top-25-use-cases-of-cloudera-flow.html
- https://github.com/tspannhw/EverythingApacheNiFi
- https://github.com/tspannhw/CloudDemo2021
- https://github.com/tspannhw/StreamingSQLExamples
- https://www.linkedin.com/pulse/2021-schedule-tim-spann/
- https://github.com/tspannhw/StreamingSQLExamples/blob/8d02e62260e82b027b43abb911b5c366a3081927/README.md

THANK YOU