Hello Hydrate! From Stream to Clickhouse with Apache Pulsar and Friends

OSA CON 2021

Stream Native

Tim Spann

Developer Advocate

DZone Zone Leader and Big Data MVB Data DJay

- https://www.datainmotion.dev/
- https://github.com/tspannhw/SpeakerProfile
- https://dev.to/tspannhw
- https://github.com/tspannhw/FLiP-Stream2Clickhouse

StreamNative

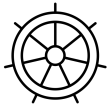
Stream Native

- Founded the original developers of Apache Pulsar.
- Passionate and dedicated team.
- StreamNative helps teams to capture, manage, and leverage data using Pulsar's unified messaging and streaming platform.

The Need For Real-Time Data

Hybrid and multi-cloud strategies with native geo-replication

Seamlessly build microservice architectures with support for streaming and messaging workloads



Built for Kubernetes CloudNative migrations with tools

360 degree customer data multi-tenancy, infinite retention, and extensive connector ecosystem

PULSAR

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

What are the Benefits of Pulsar?

Multi-Tenancy

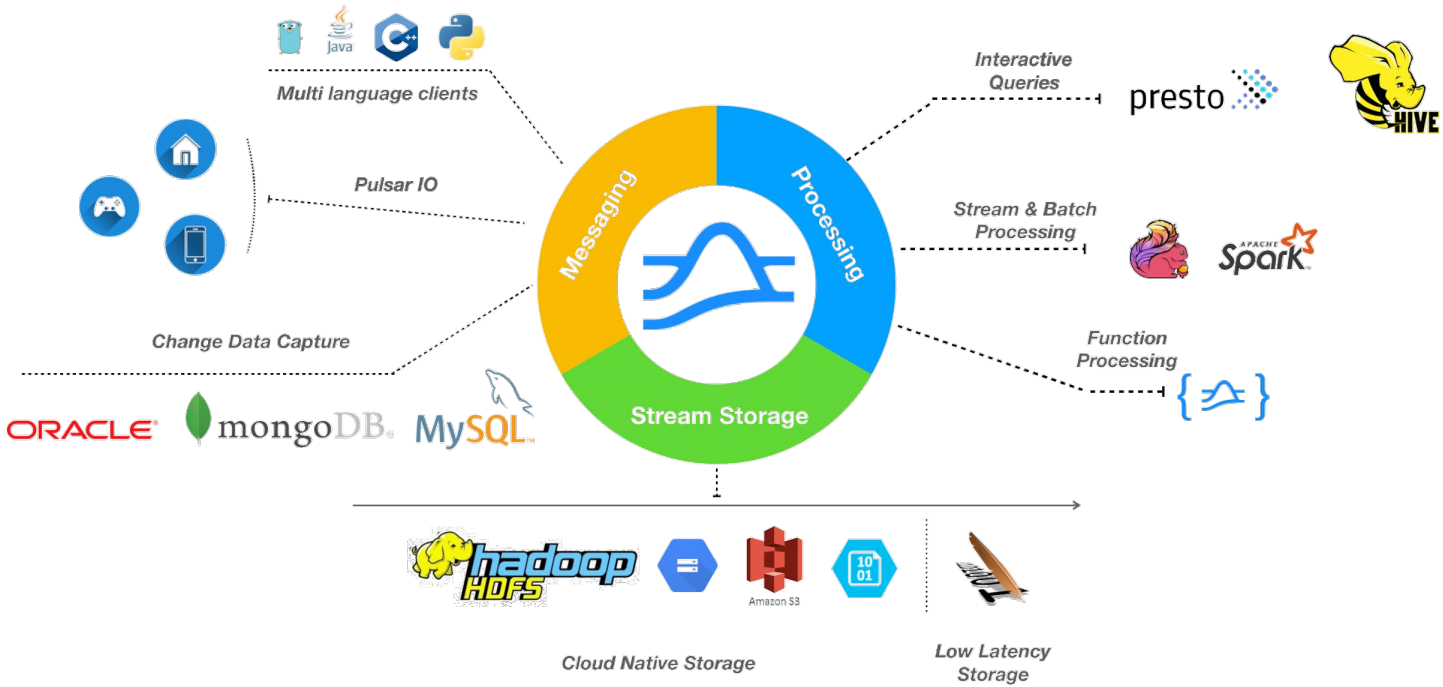
Scalability

Geo-Replication

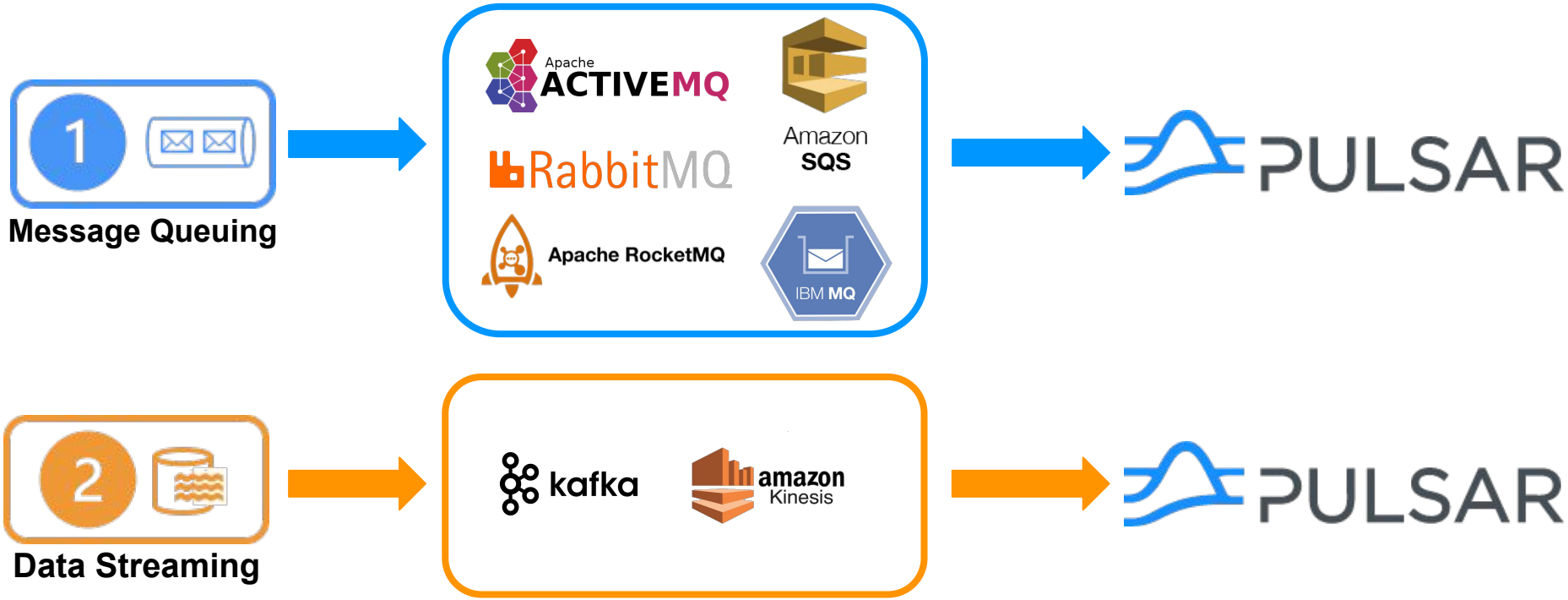
Unified Messaging Model

Data Durability

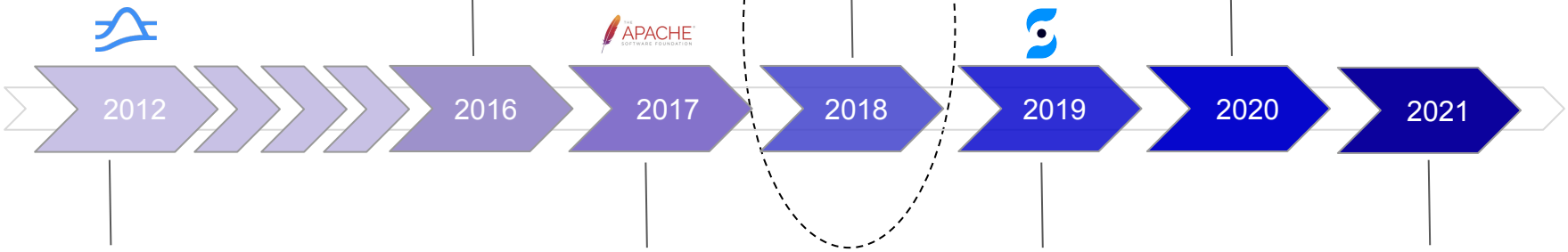
Apache Pulsar



A Unified Messaging Platform



Key Milestones



2012

Originally developed inside **Yahoo**! as “Cloud Messaging Service”

2016

Pulsar is committed to **Open Source**

2017

Pulsar is accepted into the **Apache Software Foundation**

2018

Major increase in adoption following TLP designation in 2018

Pulsar becomes a **Top-Level Project**

2019

- **StreamNative is founded** and seed round raised.
- Tencent adopts Pulsar for payment processing platform.
- BestPay adopts Pulsar for payment processing.
- Pulsar hits 200 contributors.

2020

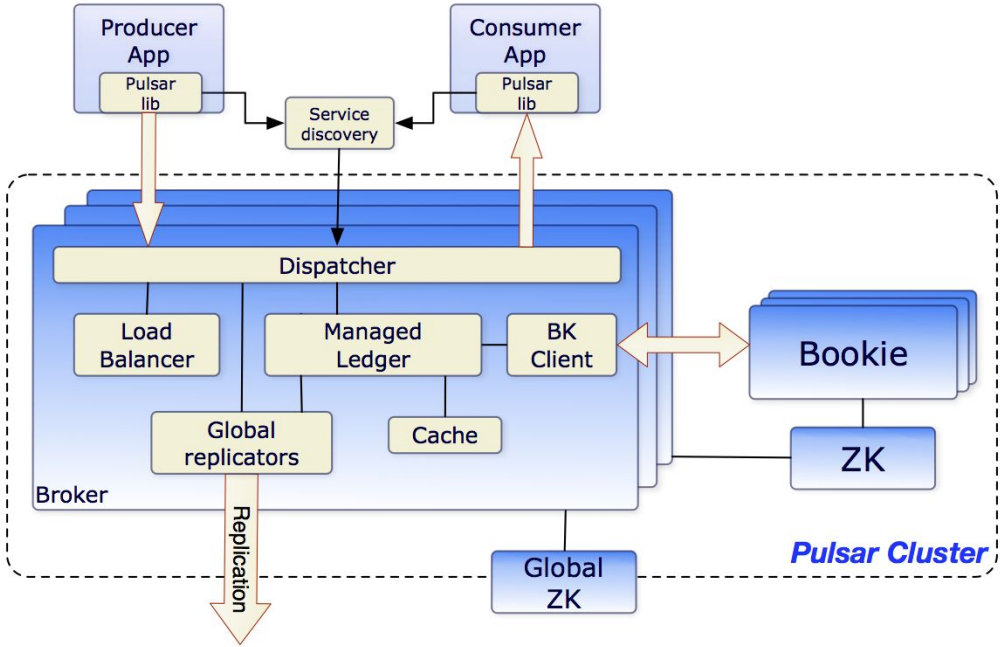
- 2 global Pulsar conferences, 80+ speakers, 1,500+ attendees
- Pulsar hits 340 contributors
- StreamNative and OVHCloud launch Kafka on Pulsar (**KoP**)
- StreamNative + China Mobile launch AMQP on Pulsar (**AoP**)
- Pulsar Ecosystem expands - StreamNative Hub launches
- **StreamNative Cloud** launches on GCP and Alibaba Cloud
- StreamNative customer adoption continues - new customers include Flipkart and Applied Materials
- Pulsar 2.7 + Transactions
- Pulsar Flink Connector 2.7

2021

- 3 global Pulsar conferences
- StreamNative hits 400 contributors (June).
- **Pulsar surpasses Kafka** in monthly active contributors.
- Pulsar 2.8 + Exactly-Once semantics
- **StreamNative Platform** launches

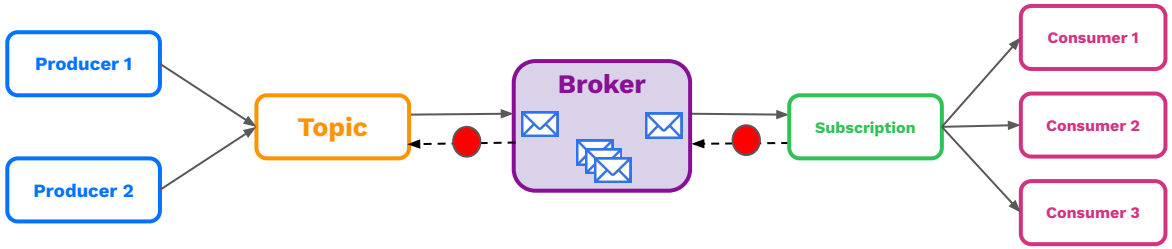
Apache Pulsar Overview

- 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
  - ...

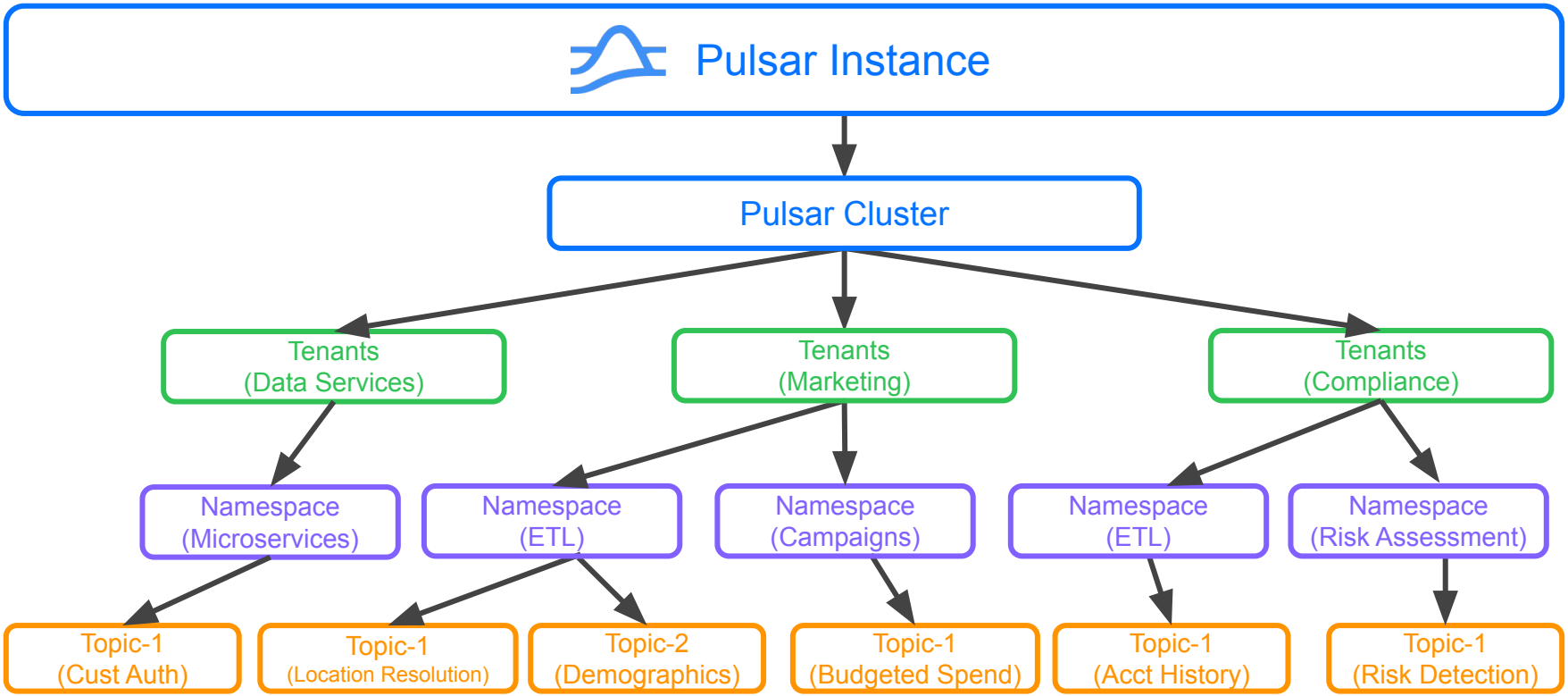


Pulsar's Publish-Subscribe model

- Producers send messages.
- Topics are an ordered, named channel that producers use to transmit messages to subscribed consumers.
- Messages belong to a topic and contain an arbitrary payload.
- Brokers handle connections and routes messages between producers / consumers.
- Subscriptions are named configuration rules that determine how messages are delivered to consumers.
- Consumers receive messages.



Topics


Pulsar Instance
Pulsar Cluster
Tenants (Data Services)
Tenants (Marketing)
Tenants (Compliance)
Namespace (Microservices)
Namespace (ETL)
Namespace (Campaigns)
Namespace (ETL)
Namespace (Risk Assessment)
Topic-1 (Cust Auth)
Topic-1 (Location Resolution)
Topic-2 (Demographics)
Topic-1 (Budgeted Spend)
Topic-1 (Acct History)
Topic-1 (Risk Detection)

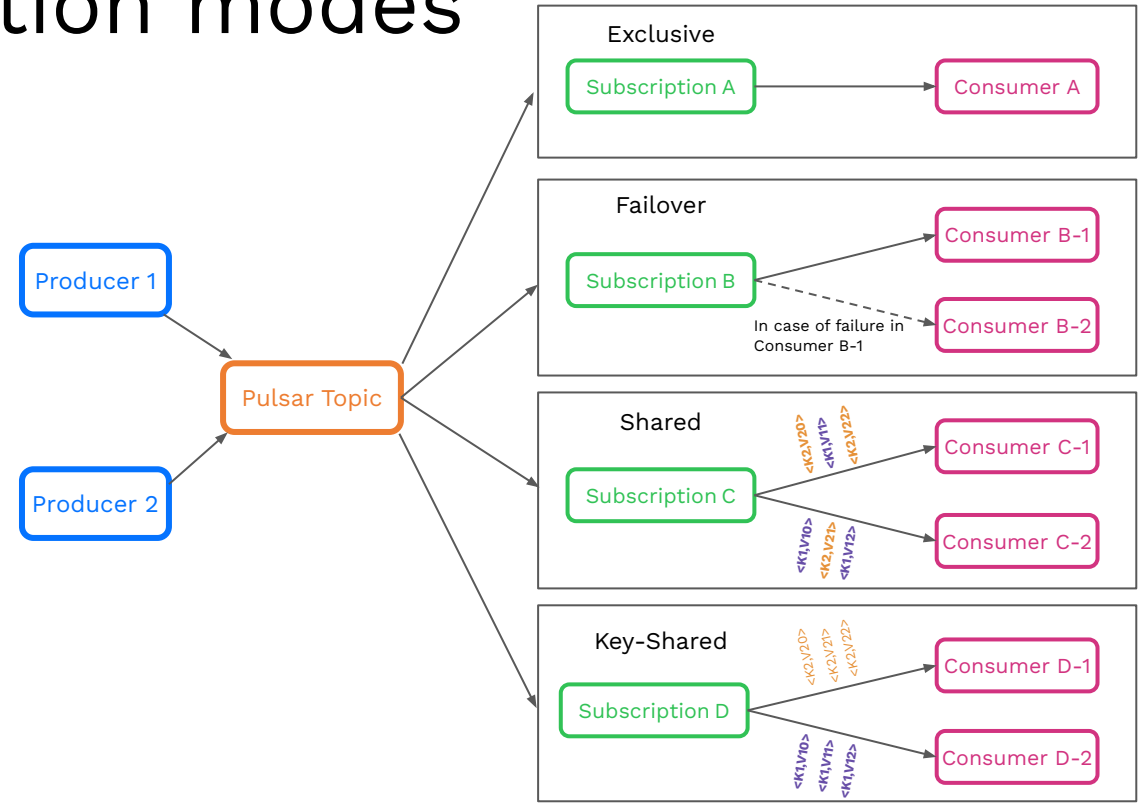
Pulsar subscription modes

Different subscription modes have different semantics:

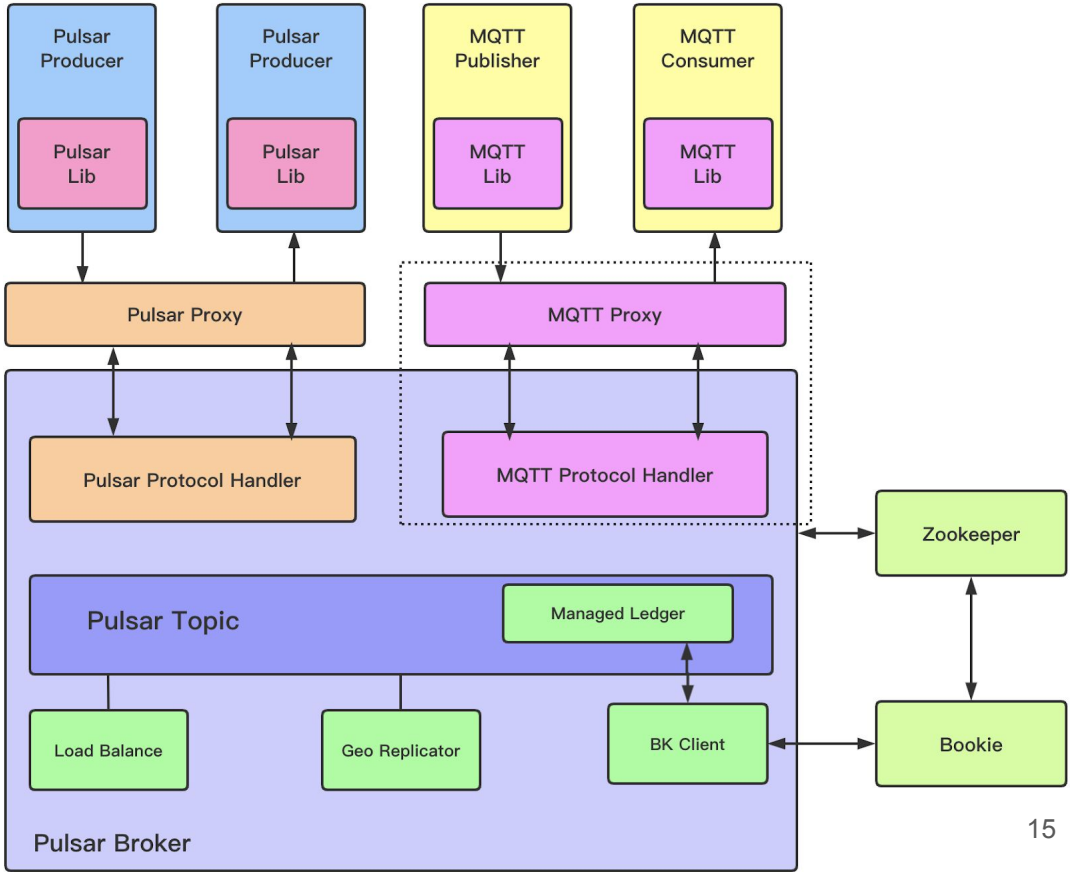
Exclusive/Failover - guaranteed order, single active consumer

Shared - multiple active consumers, no order

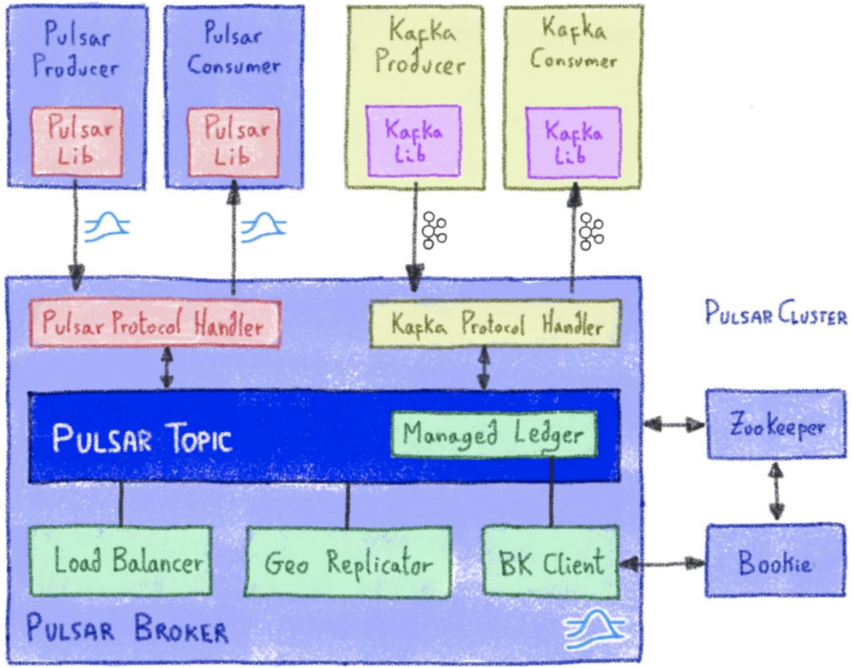
Key_Shared - multiple active consumers, order for given key

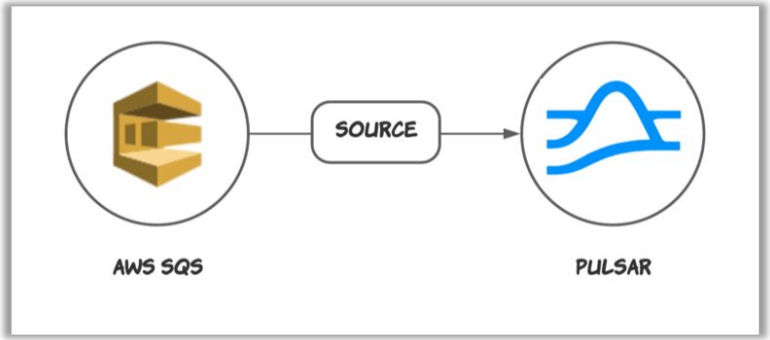


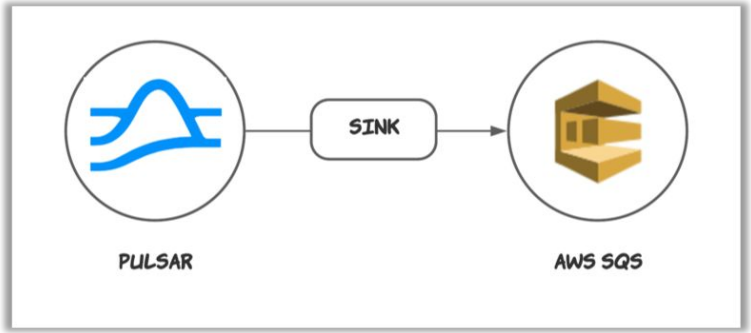
MQTT on Pulsar (MoP)

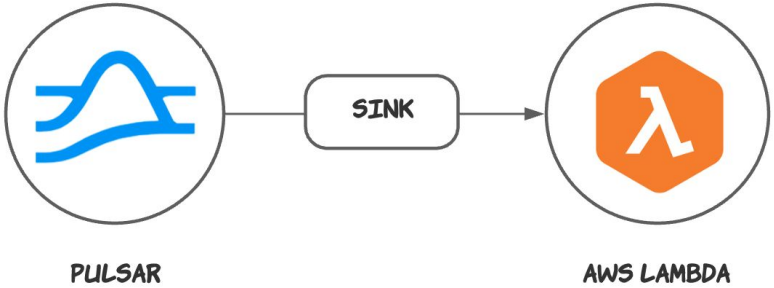


Kafka-on-Pulsar (Kop)




SOURCE
AWS SQS
PULSAR


SINK
PULSAR
AWS SQS


SINK
PULSAR
AWS LAMBDA

Moving Data Out of Pulsar to Clickhouse

IO/Connectors are a simple way to integrate with external systems and move data in and out of Pulsar. https://pulsar.apache.org/docs/en/io-jdbc-sink/

- Built on top of Pulsar Functions
- Built-in connectors - hub.streamnative.io

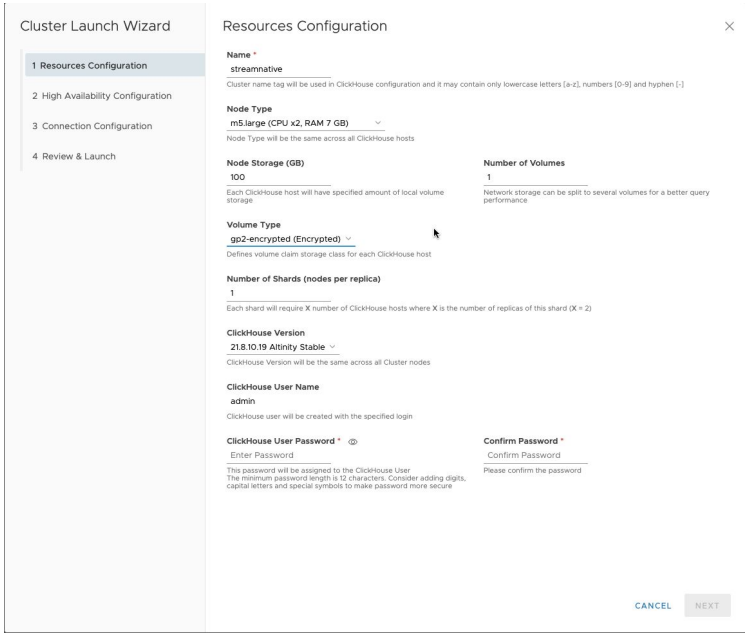
Streaming Events into Altinity Cloud

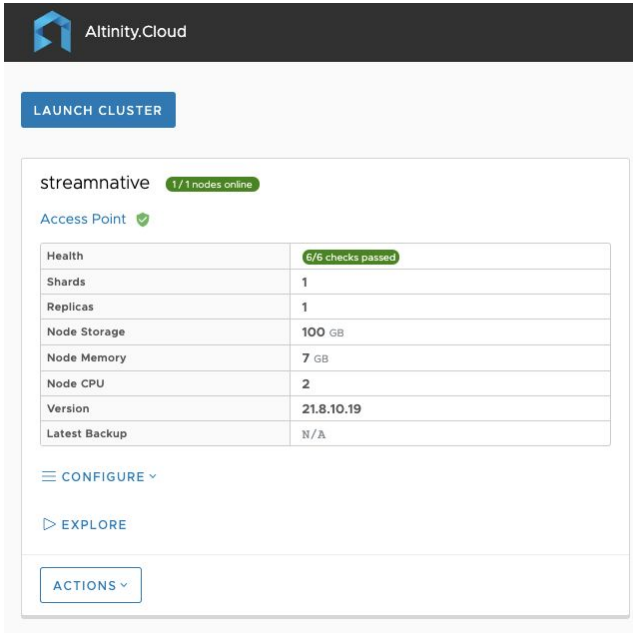
```
CREATE TABLE iotjetsonjson_local
(
       uuid String,  camera String,      ipaddress String,    networktime String,          top1pct String,
       top1 String,  cputemp String,     gputemp String,         gputempf String,
       cputempf String,     runtime String,
       host String,  filename String,    host_name String,          macaddress String,
       te String,    systemtime String,  cpu String,         diskusage String,
       memory String,       imageinput String
)
ENGINE = MergeTree()
  PARTITION BY uuid
  ORDER BY (uuid);

CREATE TABLE iotjetsonjson ON CLUSTER '{cluster}' AS iotjetsonjson_local
ENGINE = Distributed('{cluster}', default, iotjetsonjson_local, rand());
```

https://docs.altinity.com/altinitycloud/quickstartguide/connectclient/

pulsar-io-jdbc-clickhouse-2.8.0.nar

Build Cluster in Altinity Cloud





https://docs.altinity.com

Run A Cluster in Altinity Cloud

osacon2021 overview

Type	**Kubernetes**
ClickHouse Clusters	1
ClickHouse Nodes	1
Zookeeper Clusters	1
Zookeeper Nodes	1
Node Types	6

Kubernetes Namespace	**osacon2021**
Kubernetes Nodes	**3**
Availability Zones	**us-east-1a, us-east-1b, us-east-1c**
CH Operator	Version 0.15.0
Monitoring	View in Grafana

memory

cpu

https://docs.altinity.com

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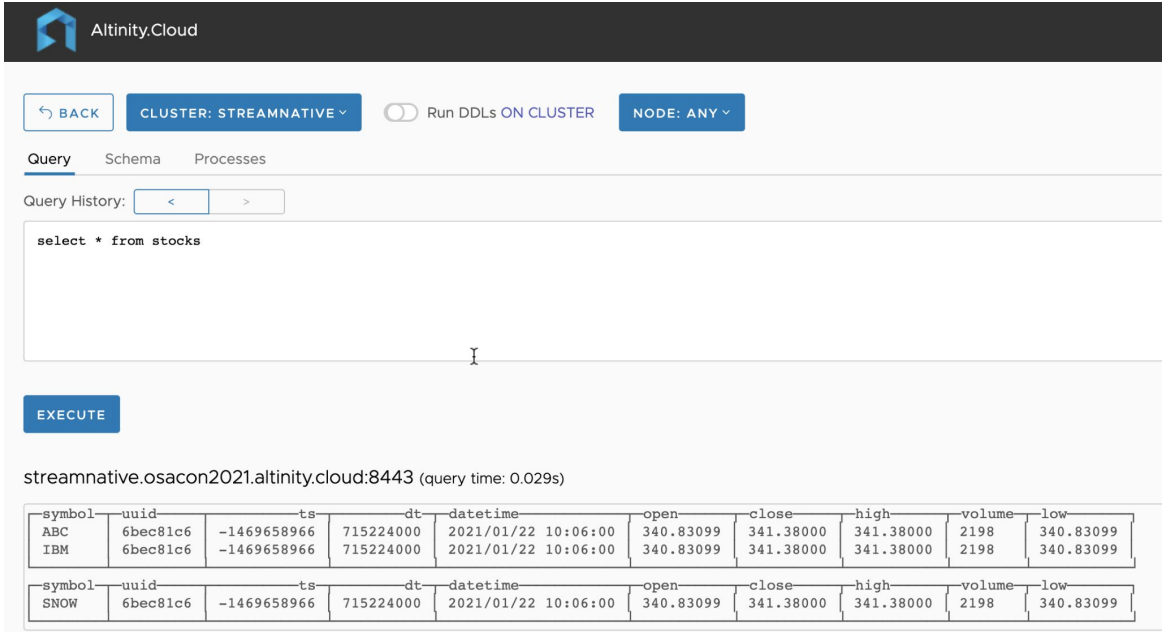
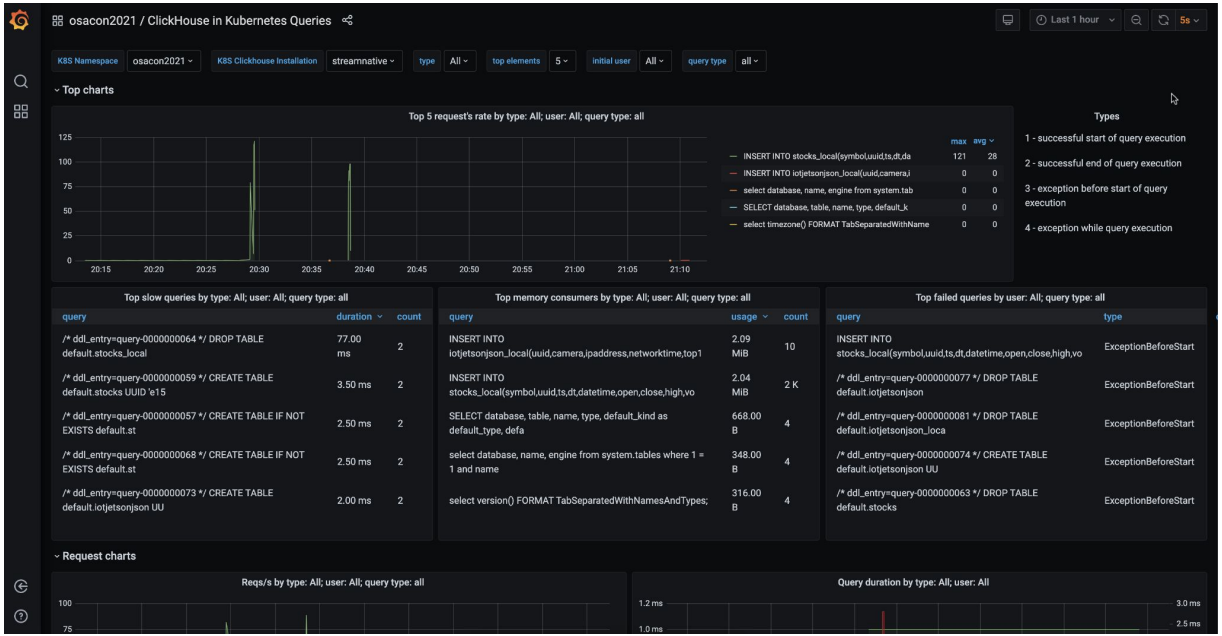
Run A Cluster in Altinity Cloud



https://docs.altinity.com

Monitor The Cluster in Altinity Cloud



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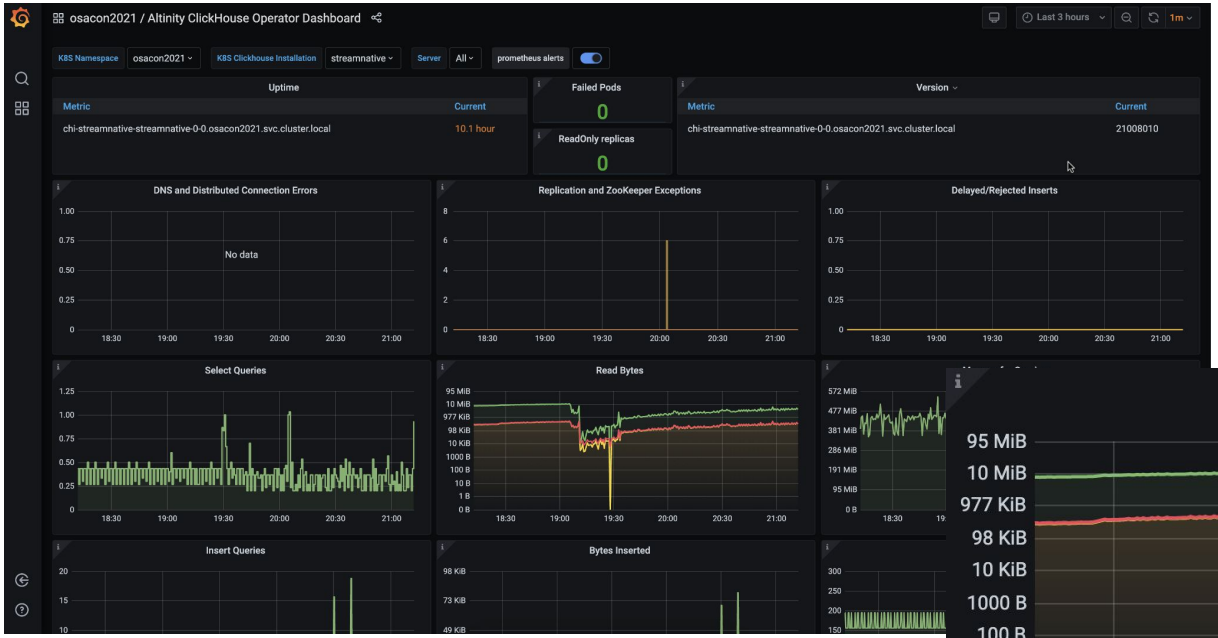
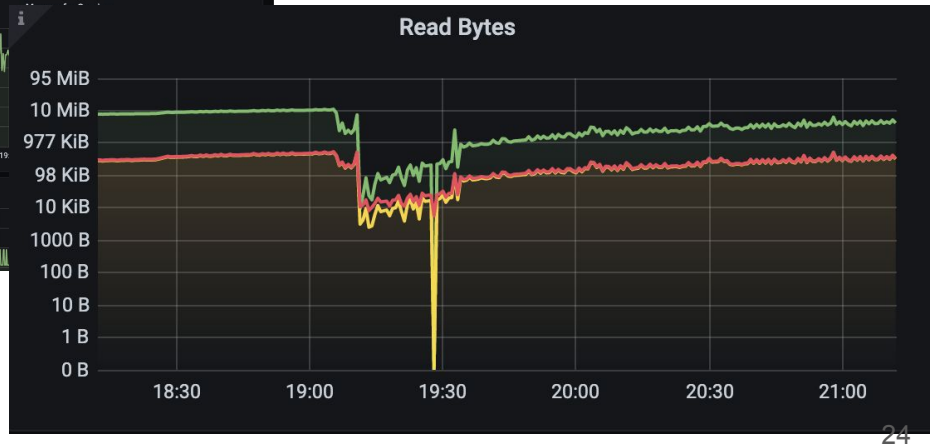


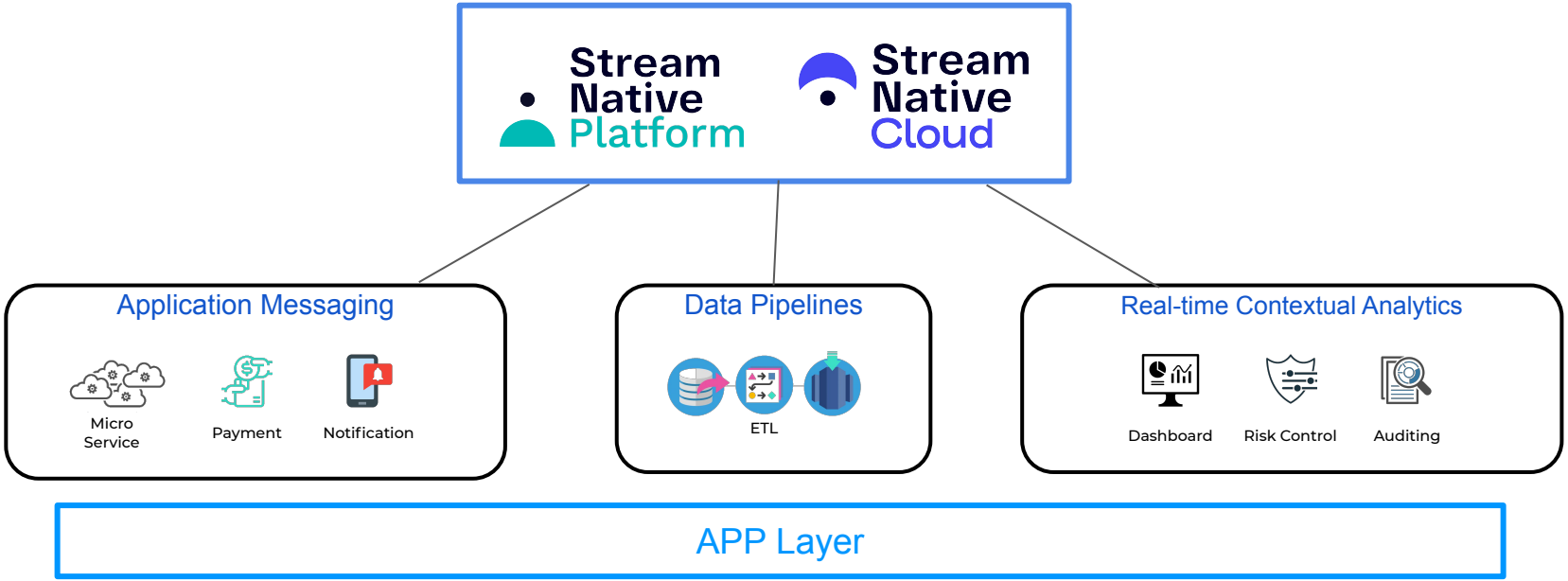


https://docs.altinity.com

StreamNative
Cloud

Stream
Native
Cloud

How Companies Use StreamNative today



StreamNative Cloud

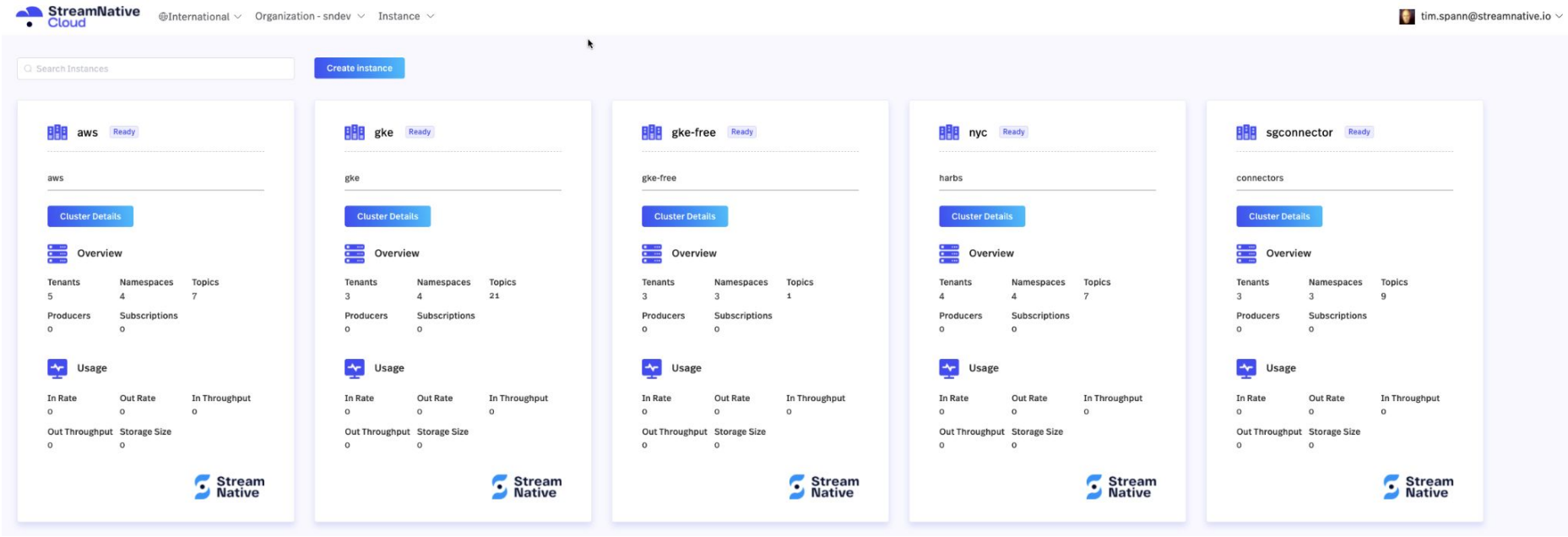
Powered by Apache Pulsar, StreamNative provides a cloud-native, real-time messaging and streaming platform to support multi-cloud and hybrid cloud strategies.

Cloud Native

Built for Containers

Flink SQL

Stream Native Cloud



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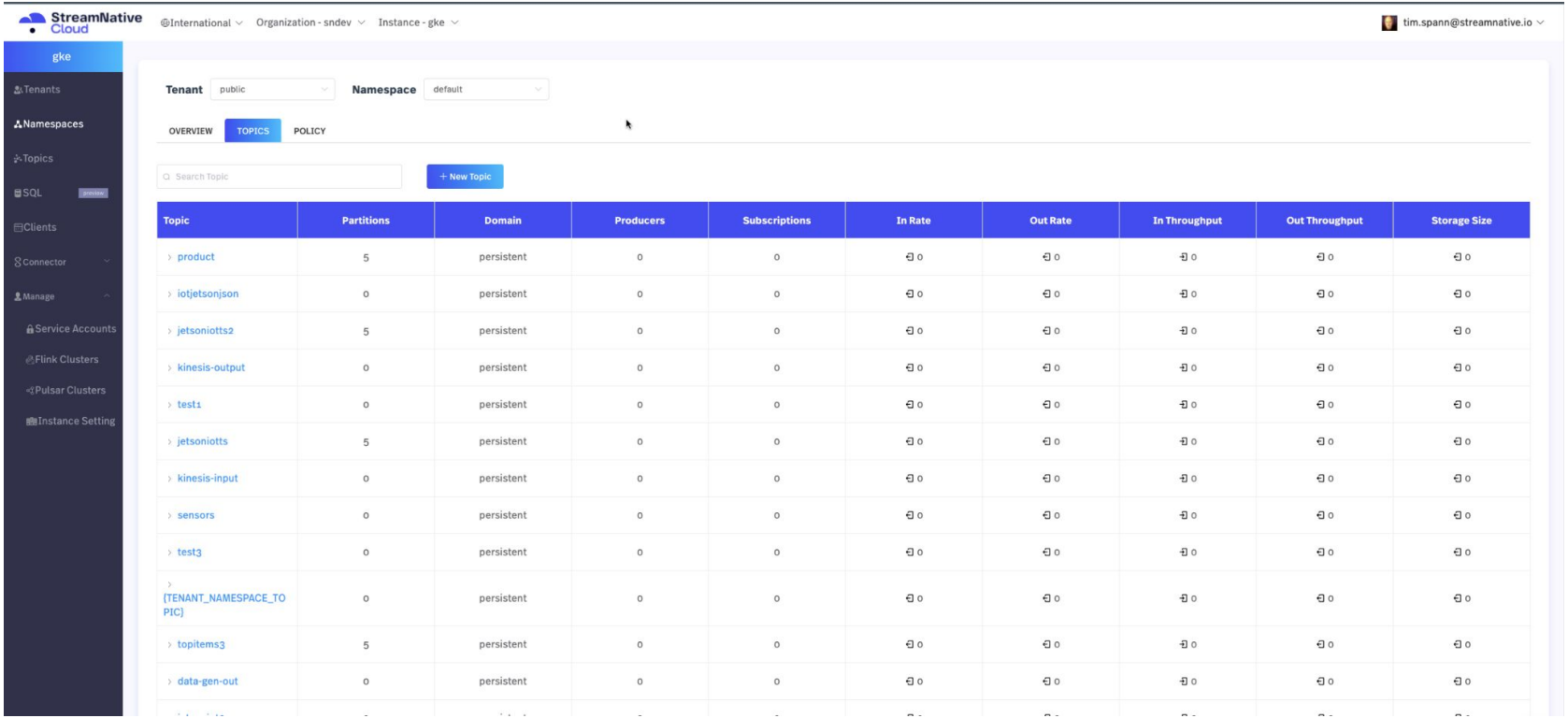
StreamNative Cloud



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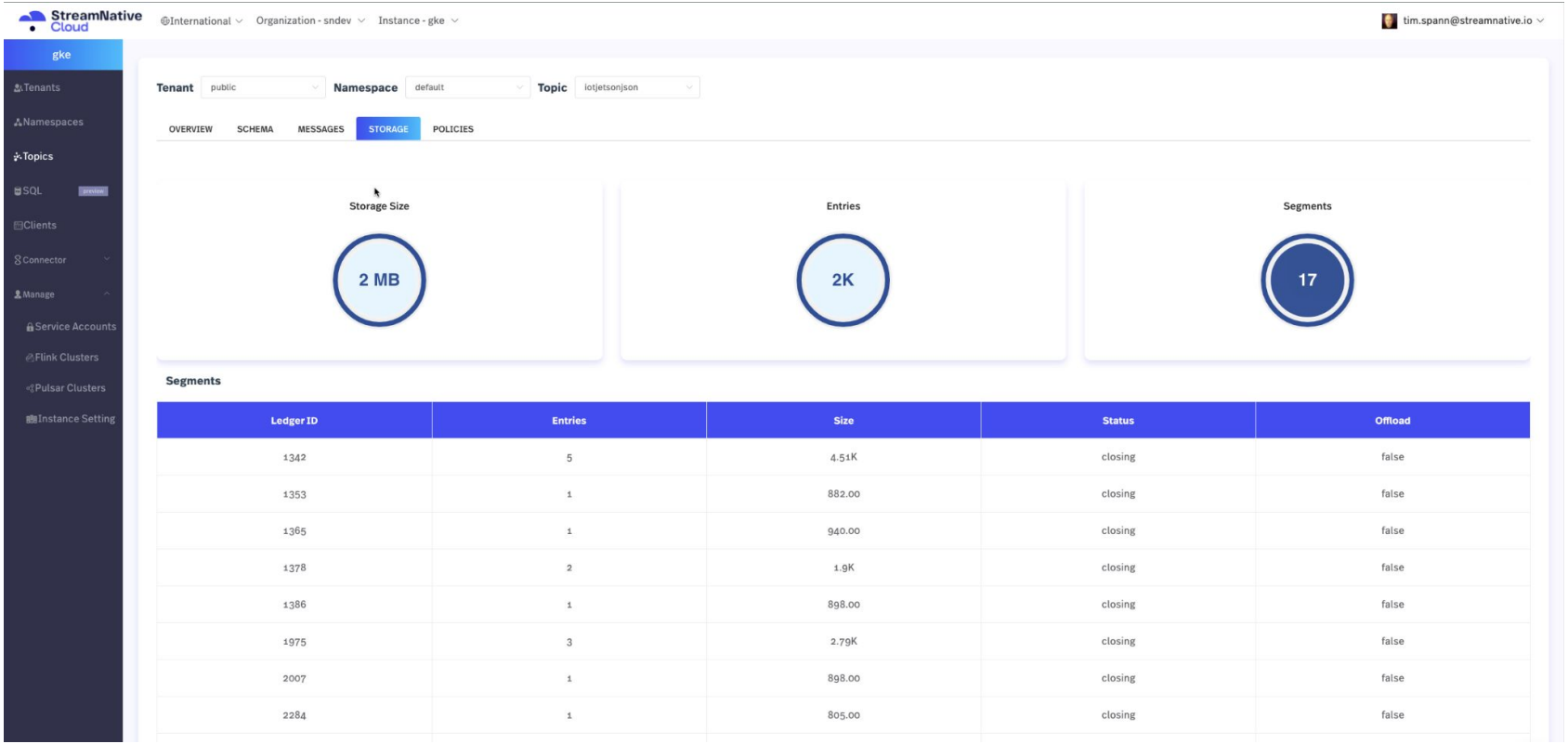

Stream Native Cloud

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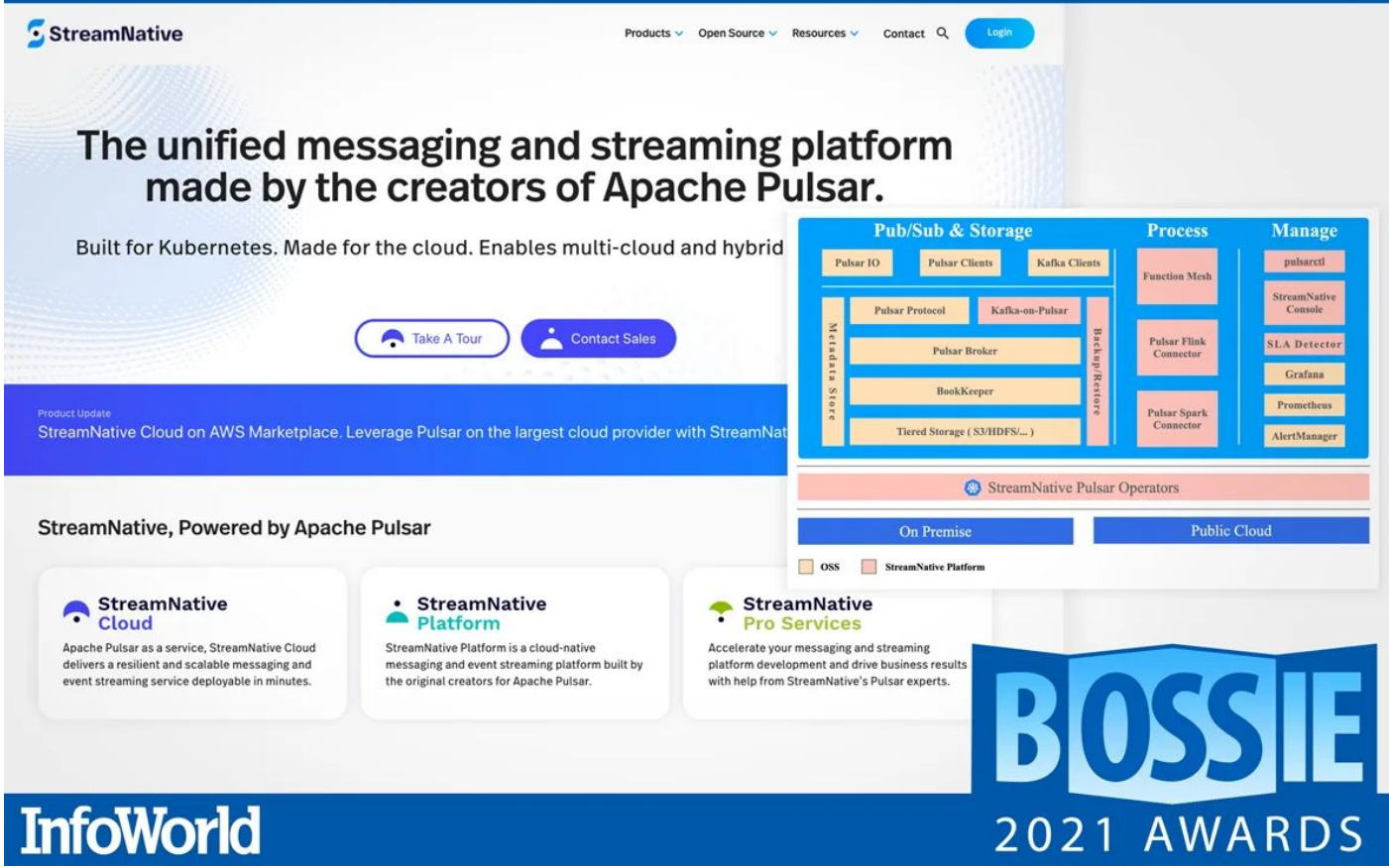
StreamNative



InfoWorld

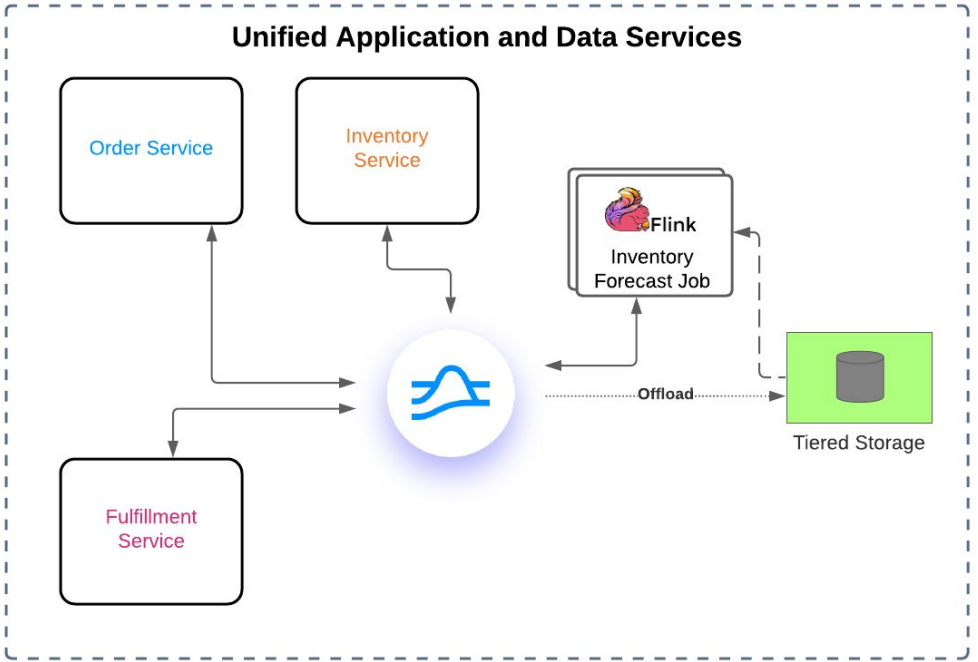
BOSSIE 2021 AWARDS

OSACON 2021

Best Practice Architectures

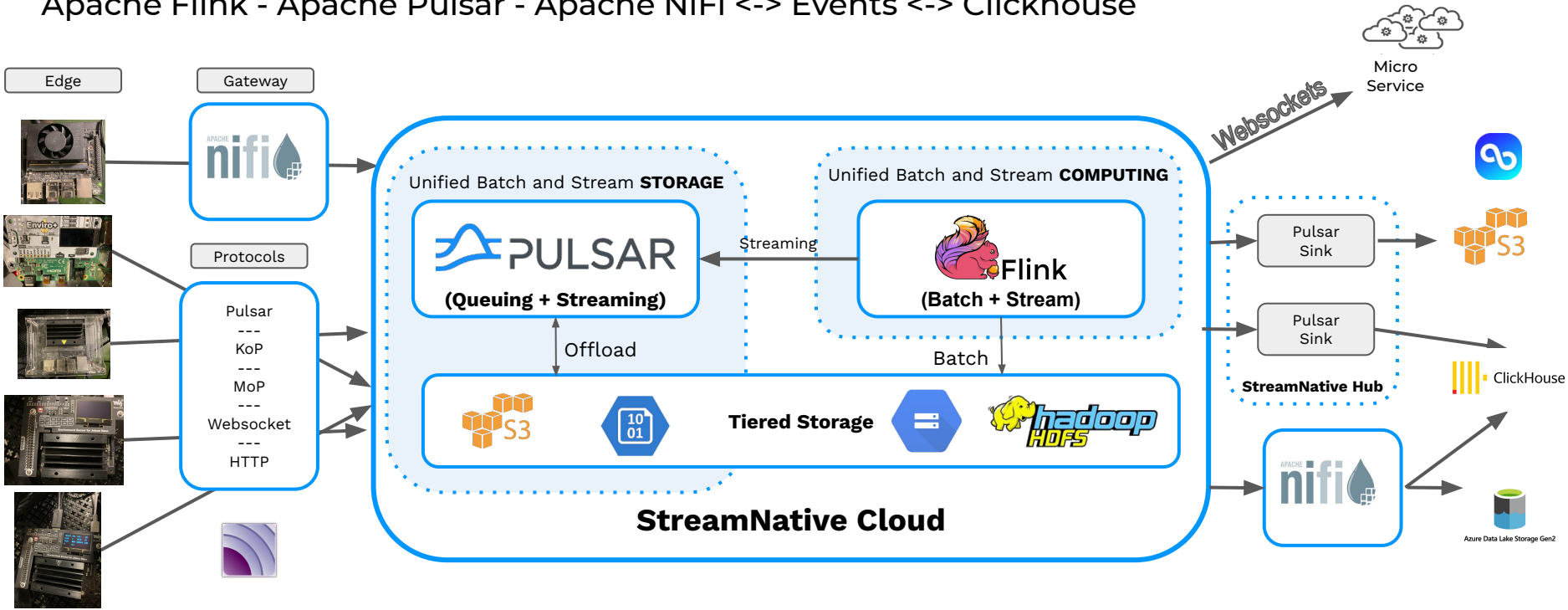
Example: E-Commerce with Pulsar

- Unified storage with access to underlying data
- Native tiered storage
- Single system to exchange data
- Teams share toolset



End-to-End Streaming FLiP(N) Apps

Apache Flink - Apache Pulsar - Apache NiFi <-> Events <-> Clickhouse



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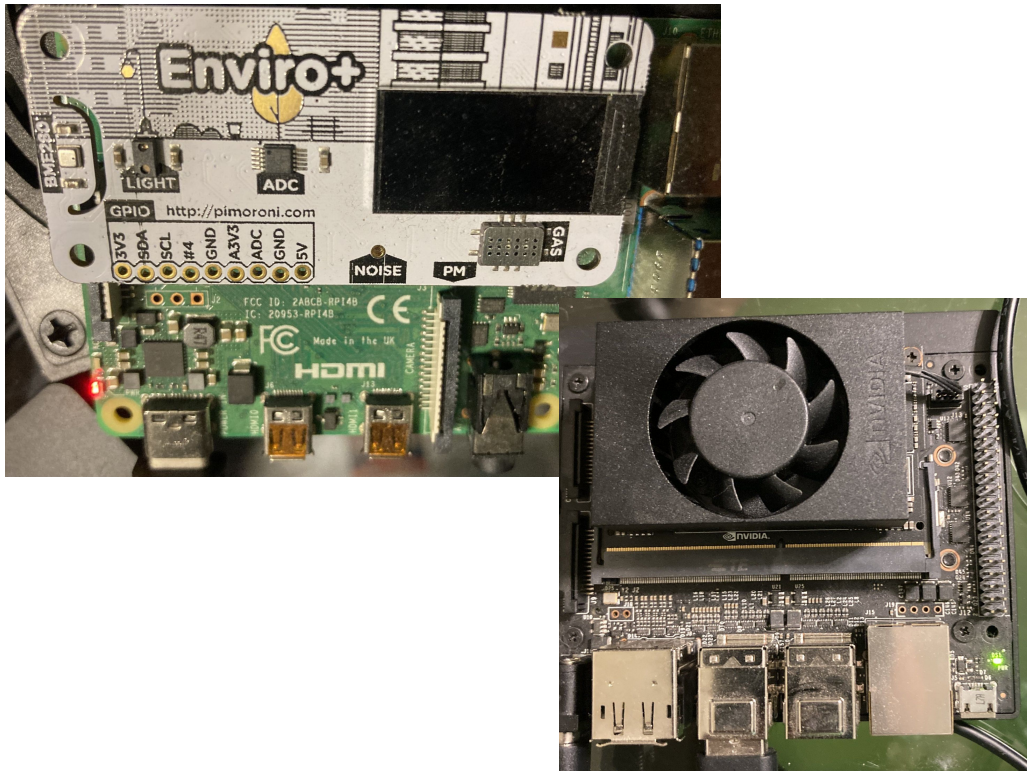
Demo

https://github.com/tspannhw/FLiP-Stream2Clickhouse/

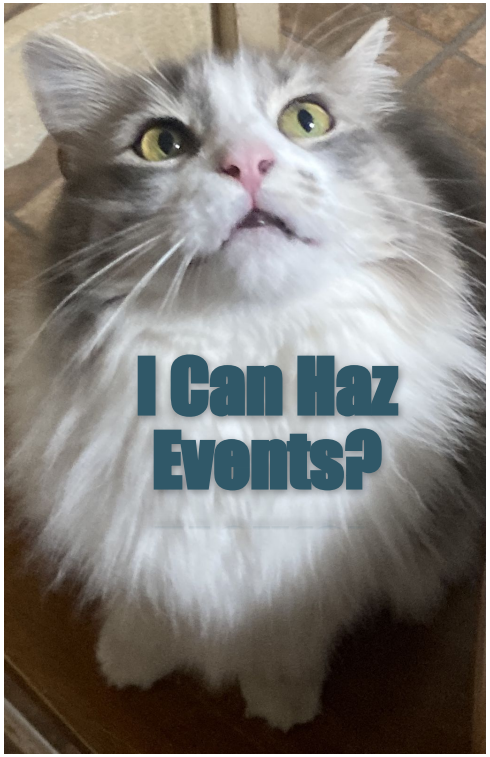
IoT Data

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

Other Sources: Transit data, news, twitter, status feeds, REST data, stock data and more.



REST JSON “stonks” Events



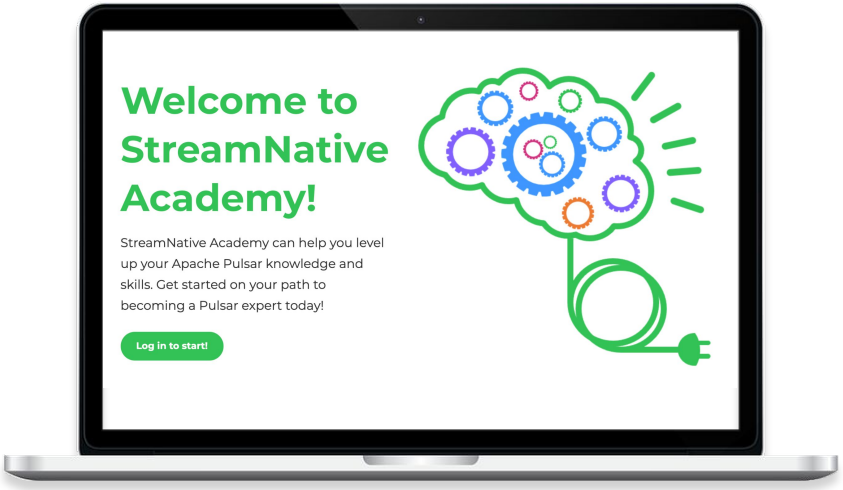
{"symbol":"STREAM",
"uuid":"10640832-f139-4b82-8780-e3ad37b3d0ce",
"ts":1618529574078,
"dt":1612098900000,
"datetime":"2021/01/31 08:15:00",
"open":"12.24500",
"close":"12.25500",
"high":"12.25500",
"volume":"12353",
"low":"12.24500"}

Wrap-Up

Now Available

On-Demand Pulsar Training

Academy.StreamNative.io



We're Hiring

streamnative.io/careers/

Connect with the Community & Stay Up-To-Date

- Join the Pulsar Slack channel - *Apache-Pulsar.slack.com*
- Follow @streamnativeio and @apache_pulsar on Twitter
- Subscribe to Monthly Pulsar Newsletter for major news, events, project updates, and resources in the Pulsar community

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Interested In Learning More?

Resources

[Flink SQL Cookbook]

[The Github Source for Flink SQL Demo]

[The GitHub Source for Demo]

Free eBooks

[Manning's Apache Pulsar in Action]

[O'Reilly Book]

Upcoming Events

[11/8] [PASS Data Community]

[11/18] [Developer Week Austin]

[11/19] [Porto Tech Hub Con]

[12/3] [Data Science Camp]

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Deeper Content

- https://www.datainmotion.dev/2020/04/building-search-indexes-with-apache.html
- https://github.com/tspannhw/nifi-solr-example
- https://github.com/streamnative/pulsar-flink
- https://www.linkedin.com/pulse/2021-schedule-tim-spann/
- https://github.com/tspannhw/SpeakerProfile/blob/main/2021/talks/20210729_HailHydrate!FromStreamtoLake_TimSpann.pdf
- https://streamnative.io/en/blog/release/2021-04-20-flink-sql-on-streamnative-cloud
- https://docs.streamnative.io/cloud/stable/compute/flink-sql
- https://github.com/tspannhw/FLiP-Stream2Clickhouse

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https://www.pulsardeveloper.com/

Let’s Keep in Touch!

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Developer Advocate

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https://github.com/tspannhw

Questions

Thank You!