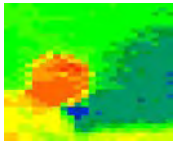
StreamNative

Building Modern Data Streaming Apps with Python

Tim Spann
Developer Advocate



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Developer Advocate

FLiP(N) Stack = Flink, Pulsar and NiFi Stack

Streaming Systems & Data Architecture Expert

Experience:

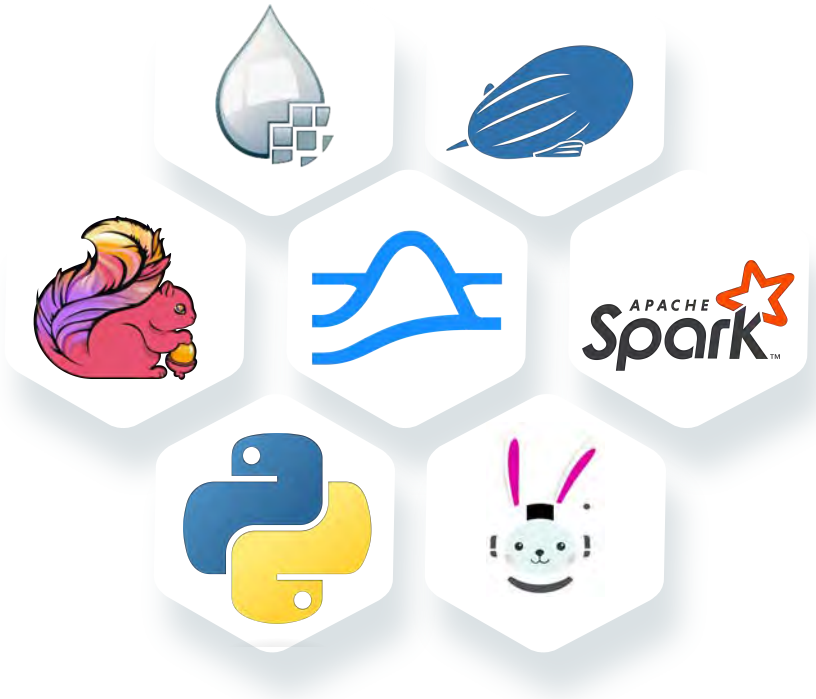
- 15+ years of experience with streaming technologies including Pulsar, Flink, Spark, NiFi, Big Data, Cloud, MXNet, IoT, Python and more.
- Today, he helps to grow the Pulsar community sharing rich technical knowledge and experience at both global conferences and through individual conversations.

FLiP Stack Weekly

This week in Apache Flink, Apache Pulsar, Apache NiFi, Apache Spark and open source friends.

https://bit.ly/32dAJft

Building Real-Time Requires a Team



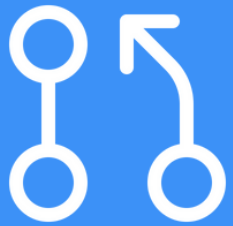
Apache Pulsar has a vibrant community

560+

Contributors

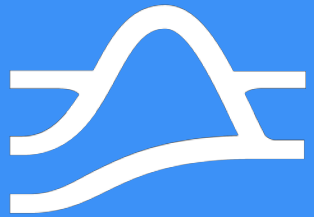
7,000+

Slack Members



10,000+

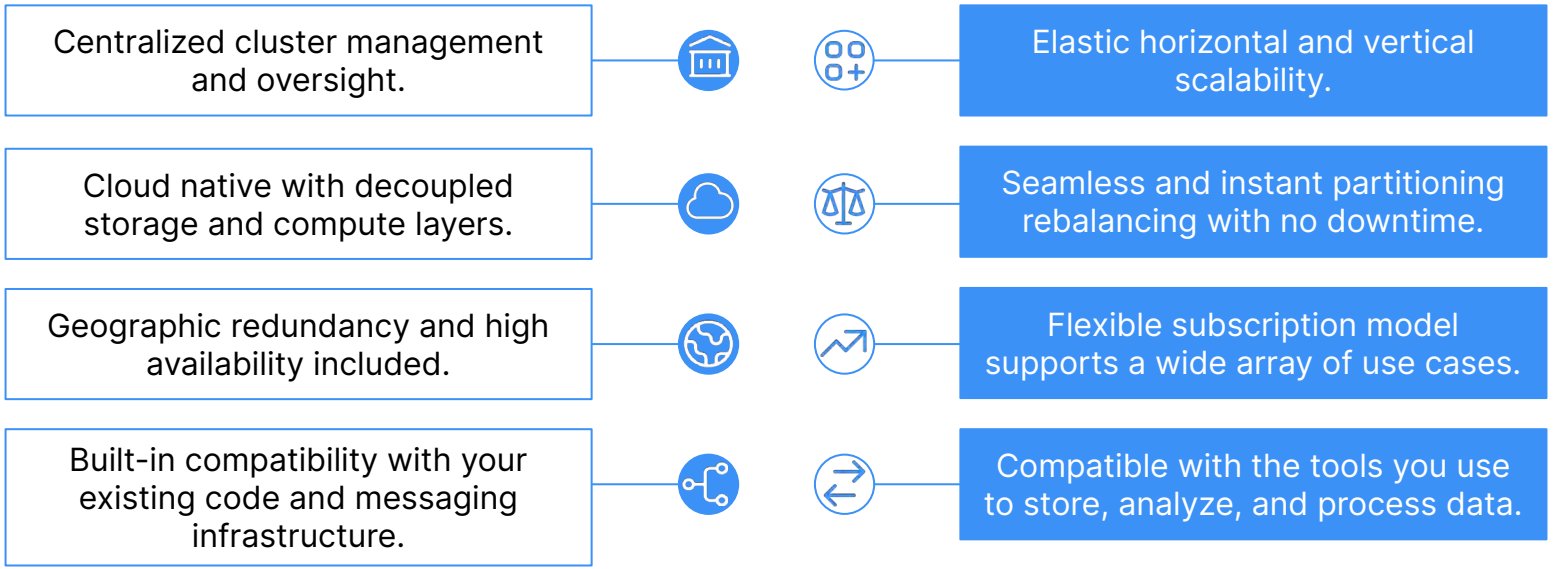
Commits



1,000+

Organizations
Using Pulsar

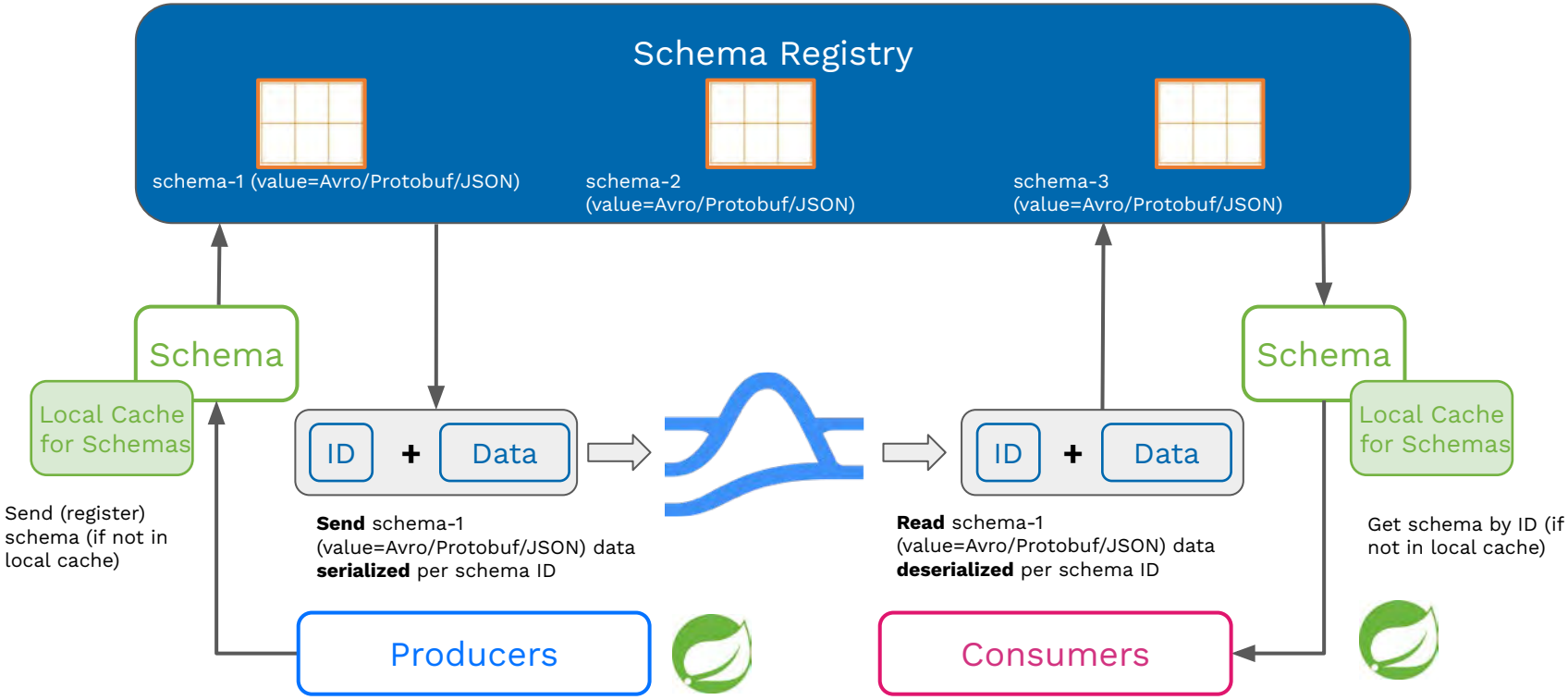
Pulsar Features



Messages - the basic unit of Pulsar

Component	Description
Value / data payload	The data carried by the message. All Pulsar messages contain raw bytes, although message data can also conform to data schemas.
Key	Messages are optionally tagged with keys, used in partitioning and also is useful for things like topic compaction.
Properties	An optional key/value map of user-defined properties.
Producer name	The name of the producer who produces the message. If you do not specify a producer name, the default name is used.
Sequence ID	Each Pulsar message belongs to an ordered sequence on its topic. The sequence ID of the message is its order in that sequence.

Integrated Schema Registry



DevOps: Pulsar Shell

Welcome to Pulsar shell!
  Service URL: pulsar://localhost:6650/
  Admin URL: http://localhost:8080/

Type help to get started or try the autocompletion (TAB button).
Type exit or quit to end the shell session.

default(localhost)>

https://pulsar.apache.org/docs/next/administration-pulsar-shell/

The FliPN kitten crosses the stream 4 ways with Apache Pulsar

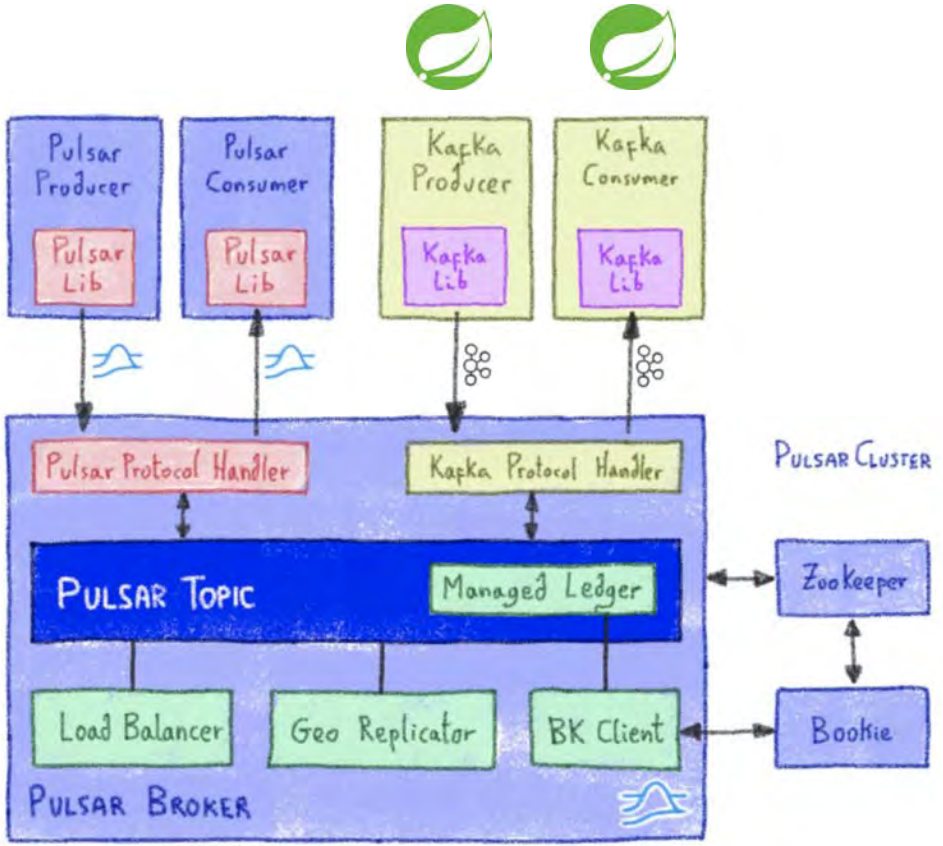
MoP

AoP

KoP

WebSockets

Kafka on Pulsar (KoP)



StreamNative Pulsar ecosystem

Protocol Handlers

kafka MQTT AMQP

Client Libraries

Scala WebSockets

Connectors (Sources & Sinks)

RabbitMQ kafka ACTIVEMQ amazon Kinesis debezium DELTA LAKE

Google Cloud Pub/Sub Google Big Query AWS Lambda ICEBERG hudi cassandra ... and more!

Pulsar Functions (Lightweight Stream Processing)

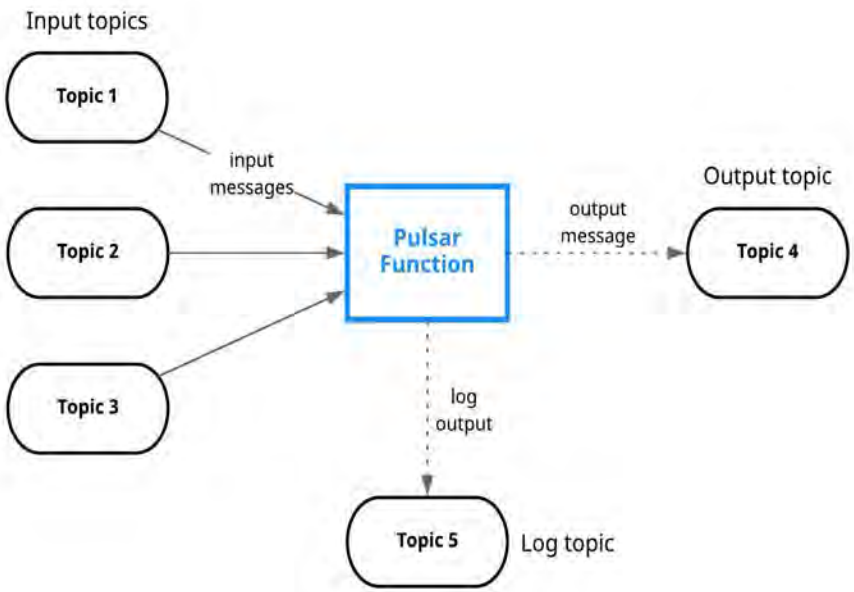
Processing Engines

Flink Spark presto trino AWS Lambda ... and more!

Data Offloaders (Tiered Storage)

Amazon S3 Google Cloud Storage hadoop

Pulsar Functions



- Consume messages from one or more Pulsar topics.
- Apply user-supplied processing logic to each message.
- Publish the results of the computation to another topic.
- Support multiple programming languages (**Java**, Python, Go)
- Can leverage 3rd-party libraries to support the **execution of ML models on the edge.**

ML Function

Entire Function

```
from pulsar import Function
from vaderSentiment.vaderSentiment import SentimentIntensityAnalyzer
import json
class Chat(Function):
    def __init__(self):
        pass
    def process(self, input, context):
        fields = json.loads(input)
        sid = SentimentIntensityAnalyzer()
        ss = sid.polarity_scores(fields["comment"])
        row = { }
        row['id'] = str(msg_id)
        if ss['compound'] < 0.00:
            row['sentiment'] = 'Negative'
        else:
            row['sentiment'] = 'Positive'
        row['comment'] = str(fields["comment"])
        json_string = json.dumps(row)
        return json_string
```

Starting a Function - Distributed Cluster

Once compiled into a JAR, start a Pulsar Function in a distributed cluster:

```
pulsar-admin functions create \
  --jar myjar.jar \
  --classname path.to.PulsarFunction \
  --inputs inputtopic \
  --output outputtopic \
  --name functionname
```

Building Tenant, Namespace, Topics

```
bin/pulsar-admin tenants create meetup

bin/pulsar-admin namespaces create meetup/newjersey

bin/pulsar-admin tenants list

bin/pulsar-admin namespaces list meetup

bin/pulsar-admin topics create persistent://meetup/newjersey/first

bin/pulsar-admin topics list meetup/newjersey
```

Install Python 3 Pulsar Client

```
pip3 install pulsar-client=='2.9.1[all]'

# Depending on Platform May Need C++ Client Built
```

For Python on Pulsar on Pi https://github.com/tspannhw/PulsarOnRaspberryPi

https://pulsar.apache.org/docs/en/client-libraries-python/

Building a Python3 Producer

```
import pulsar

client = pulsar.Client('pulsar://localhost:6650')
producer
client.create_producer('persistent://conf/ete/first')
producer.send(('Simple Text Message').encode('utf-8'))
client.close()
```

Producer with OAuth to Cloud

```
python3 prod.py -su pulsar+ssl://name1.name2.snio.cloud:6651 -t
persistent://public/default/pyth --auth-params
'{"issuer_url":"https://auth.streamnative.cloud", "private_key":"my.json",
"audience":"urn:sn:pulsar:name:myclustr"}'

from pulsar import Client, AuthenticationOauth2
parse = argparse.ArgumentParser(prog=prod.py')
parse.add_argument('-su', '--service-url', dest='service_url', type=str,
required=True)
args = parse.parse_args()
client = pulsar.Client(args.service_url,
          authentication=AuthenticationOauth2(args.auth_params))
```

https://github.com/streamnative/examples/blob/master/cloud/python/OAuth2Producer.py

https://github.com/tspannhw/FLiP-Pi-BreakoutGarden

Example Avro Schema Usage

```
import pulsar
from pulsar.schema import *
from pulsar.schema import AvroSchema
class thermal(Record):
    uuid = String()
client = pulsar.Client('pulsar://pulsar1:6650')
thermalschema = AvroSchema(thermal)
producer =
client.create_producer(topic='persistent://public/default/pi-thermal-avro',
         schema=thermalschema,properties={"producer-name": "thrm" })
thermalRec = thermal()
thermalRec.uuid = "unique-name"
producer.send(thermalRec,partition_key=uniqueid)
```

https://github.com/tspannhw/FLiP-Pi-Thermal

Example JSON Schema Usage

```
import pulsar
from pulsar.schema import *
from pulsar.schema import JsonSchema
class weather(Record):
    uuid = String()
client = pulsar.Client('pulsar://pulsar1:6650')
wsc = JsonSchema(thermal)
producer =
client.create_producer(topic='persistent://public/default/wthr,schema=wsc,pro
perties={"producer-name": "wthr" })
weatherRec = weather()
weatherRec.uuid = "unique-name"
producer.send(weatherRec,partition_key=uniqueid)
```

https://github.com/tspannhw/FLiP-PulsarDevPython101

https://github.com/tspannhw/FLiP-Pi-Weather

Building a Python Producer

```
import pulsar
client = pulsar.Client('pulsar://localhost:6650')
consumer =
client.subscribe('persistent://conf/ete/first',subscription_name='mine')

while True:
    msg = consumer.receive()
    print("Received message: '%s'" % msg.data())
    consumer.acknowledge(msg)
client.close()
```

Sending MQTT Messages

```
pip3 install paho-mqtt

import paho.mqtt.client as mqtt
client = mqtt.Client("rpi4-iot")
row = { }
row['gasKO'] = str(readings)
json_string = json.dumps(row)
json_string = json_string.strip()
client.connect("pulsar-server.com", 1883, 180)
client.publish("persistent://public/default/mqtt-2",
payload=json_string,qos=0,retain=True)
```

https://www.slideshare.net/bunkertor/data-minutes-2-apache-pulsar-with-mqtt-for-edge-computing-lightning-2022

Sending Websocket Messages

```
pip3 install websocket-client

import websocket, base64, json
topic = 'ws://server:8080/ws/v2/producer/persistent/public/default/topic1'
ws = websocket.create_connection(topic)
message = "Hello Philly ETE Conference"
message_bytes = message.encode('ascii')
base64_bytes = base64.b64encode(message_bytes)
base64_message = base64_bytes.decode('ascii')
ws.send(json.dumps({'payload' : base64_message,'properties': {'device' :
'macbook'},'context' : 5}))
response =  json.loads(ws.recv())
```

https://github.com/tspannhw/FLiP-IoT/blob/main/wsreader.py
https://github.com/tspannhw/FLiP-IoT/blob/main/wspulsar.py
https://pulsar.apache.org/docs/en/client-libraries-websocket/

Sending Kafka Messages

```
pip3 install kafka-python

from kafka import KafkaProducer
from kafka.errors import KafkaError

row = { }
row['gasKO'] = str(readings)
json_string = json.dumps(row)
json_string = json_string.strip()

producer = KafkaProducer(bootstrap_servers='pulsar1:9092',retries=3)
producer.send('topic-kafka-1', json.dumps(row).encode('utf-8'))
producer.flush()
```

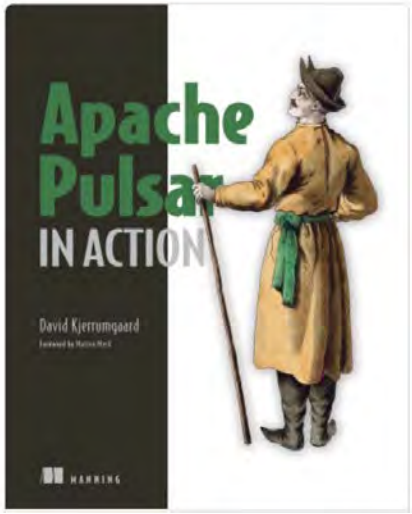
https://docs.streamnative.io/platform/v1.0.0/concepts/kop-concepts

https://github.com/streamnative/kop

DevOps: Deploying Functions

```
bin/pulsar-admin functions create --auto-ack true --py py/src/sentiment.py
--classname "sentiment.Chat" --inputs "persistent://public/default/chat"
--log-topic "persistent://public/default/logs" --name Chat --output
"persistent://public/default/chatresult"
```

https://github.com/tspannhw/pulsar-pychat-function



Apache Pulsar in Action

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