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Streaming Apache Kudu within Apache Flink

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Part 01

Recap on Apache Kudu & Apache Flink

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Recap: Apache Kudu

Apache Kudu is an open-source distributed data storage engine that makes fast analytics on fast and changing data easy.

- Data model – table based
- Low-latency random access – millisecond-scale access to individual rows
- Columnar storage for fast analytics
- Apache Hadoop ecosystem integration

From: https://kudu.apache.org/

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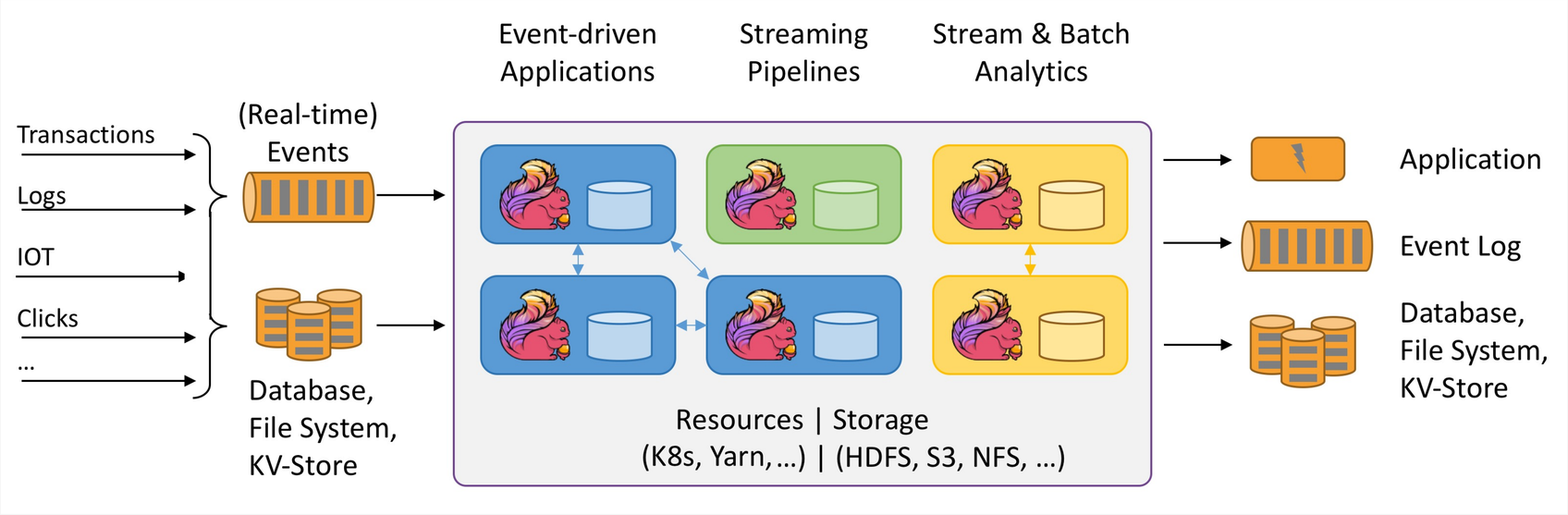
Recap: Apache Flink

Apache Flink is a framework and distributed processing engine for stateful computations over unbounded and bounded data streams. Flink has been designed to run in all common cluster environments, perform computations at in-memory speed and at any scale.



From: https://flink.apache.org

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Part 02

Streaming Kudu in Flink

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Streaming Kudu in Flink

Reading data in Kudu table in a continuous way in order in Flink

- As a source of the data stream
- Challenges: reading data in order
  - Natural order: data arrival
  - Customized order: special criteria

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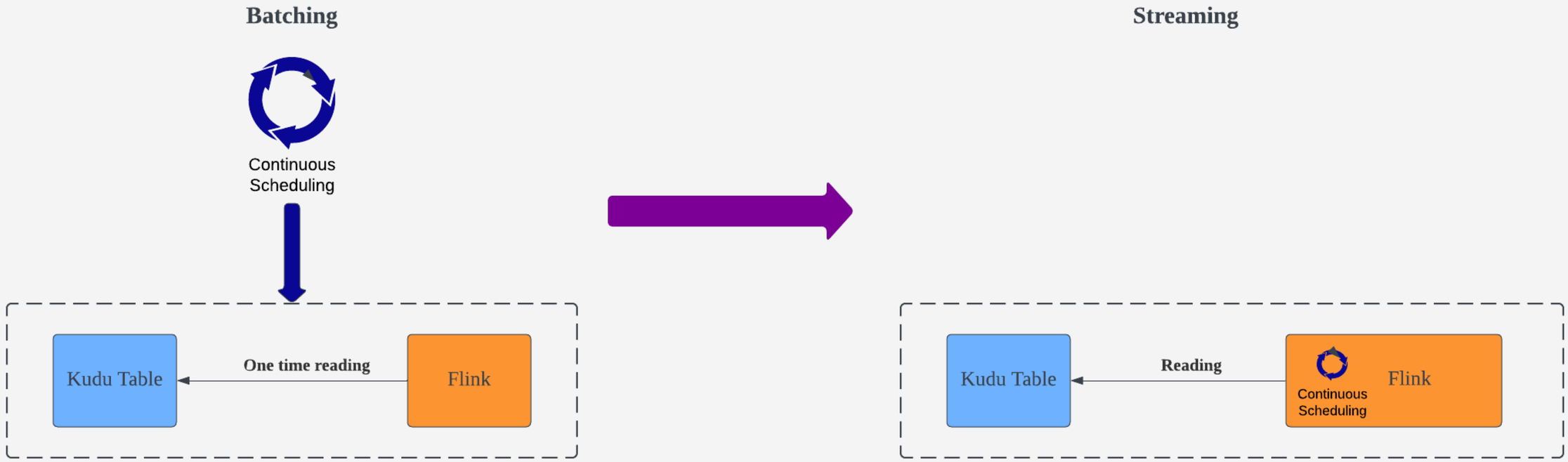
Streaming Kudu in Flink

Source of the data stream

- Fully integrated with Flink as a part of stream pipeline



Streaming Kudu in Flink

Nature order

- Incremental primary key
- Data creation datetime
- Etc.

ID	NAME	AGE
10001	Jack	60
10002	Tom	40
10003	Mary	20
...		

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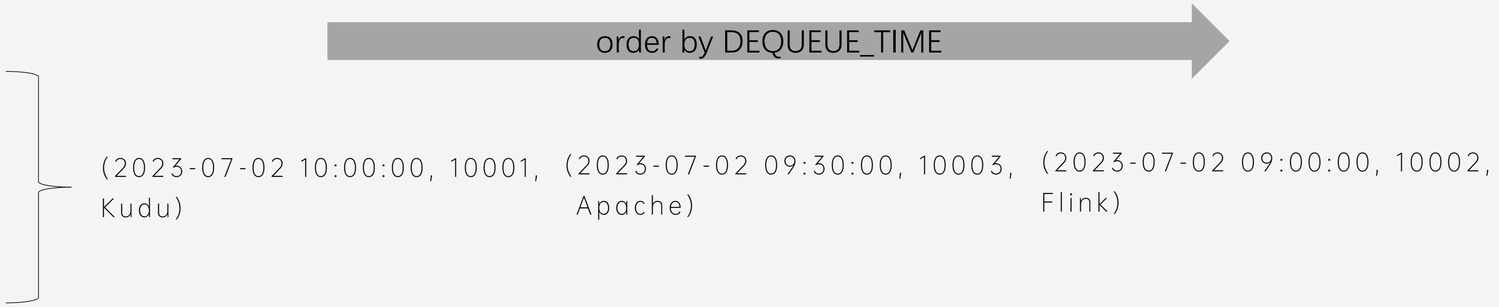
Streaming Kudu in Flink

Customized order

- Dequeue time for a priority queue
- Etc.

DEQUEUE_TIME	ID	MESSAGE
2023-07-02 10:00:00	10001	Kudu
2023-07-02 09:00:00	10002	Flink
2023-07-02 09:30:00	10003	Apache
…		



Part 03

Solution

Solution

Flink source connector for Kudu

- Support data stream
- Two reading mode:
  - Read and sweep
  - Read with offset
- Annotation based configuration

Solution

Read and sweep

- Customized order: read with customized criteria
- Sweeping the records which have been read periodically

DEQUEUE_TIME	ID	MESSAGE
2023-07-02 10:00:00	10001	Kudu
2023-07-02 09:00:00	10002	Flink
2023-07-02 09:30:00	10003	Apache
...		

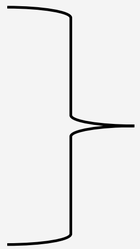
Solution

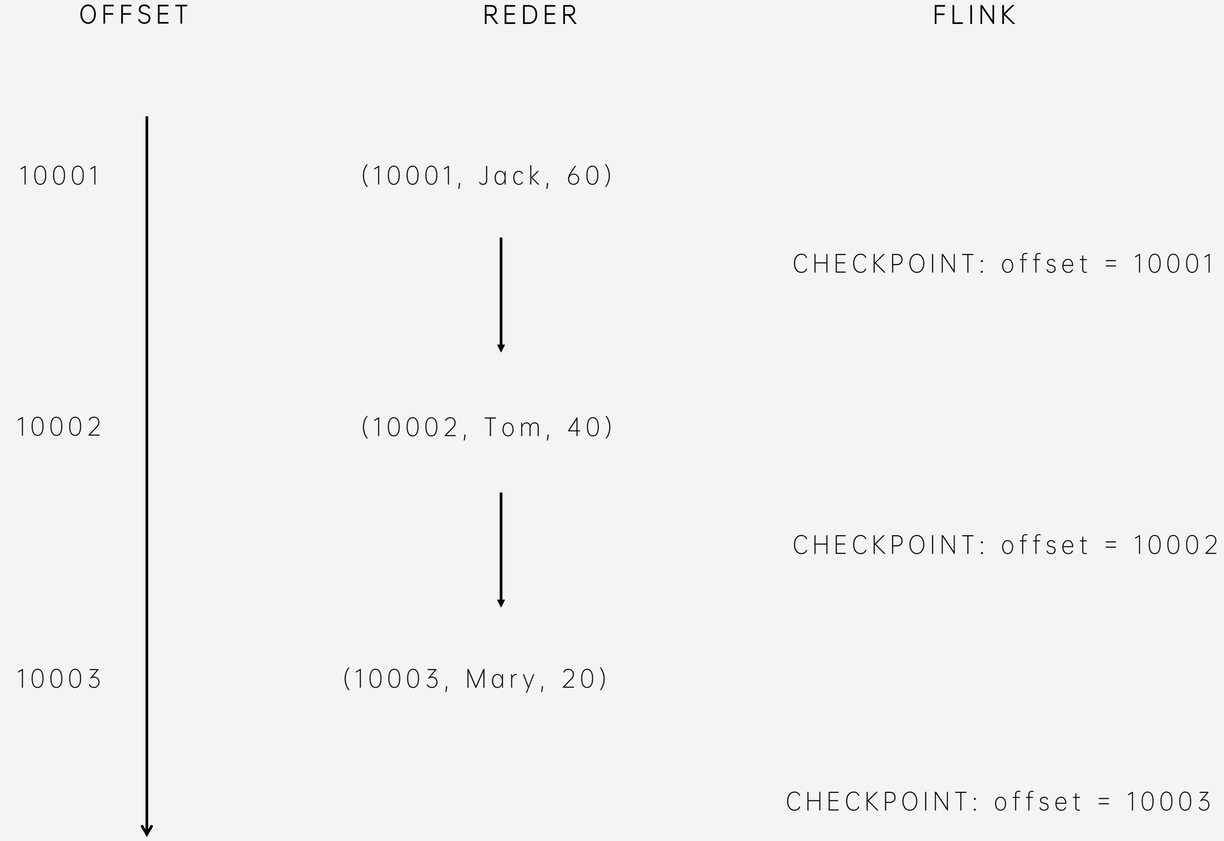
Read with offset

- Natural order: unique identifier with sequence, single or compound
- Offset is stored with Flink state for recovery
- A in memory high water mark (HWM) guides the reading, offset of the last record read

ID as offset

ID	NAME	AGE
10001	Jack	60
10002	Tom	40
10003	Mary	20
...		





Solution

Annotation based configuration

- Java class to map the Kudu table schema
- Annotation to identify the column and reading offset details
  - @ColumnDetail
  - @StreamingKey

```
public class User {
    @StreamingKey(order = 1)
    @ColumnDetail(name = "created_time")
    private Long createdTime;

    @ColumnDetail(name = "name")
    private String name;

    @ColumnDetail(name = "age")
    private Integer age;
}
```

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Part 04

Case Study

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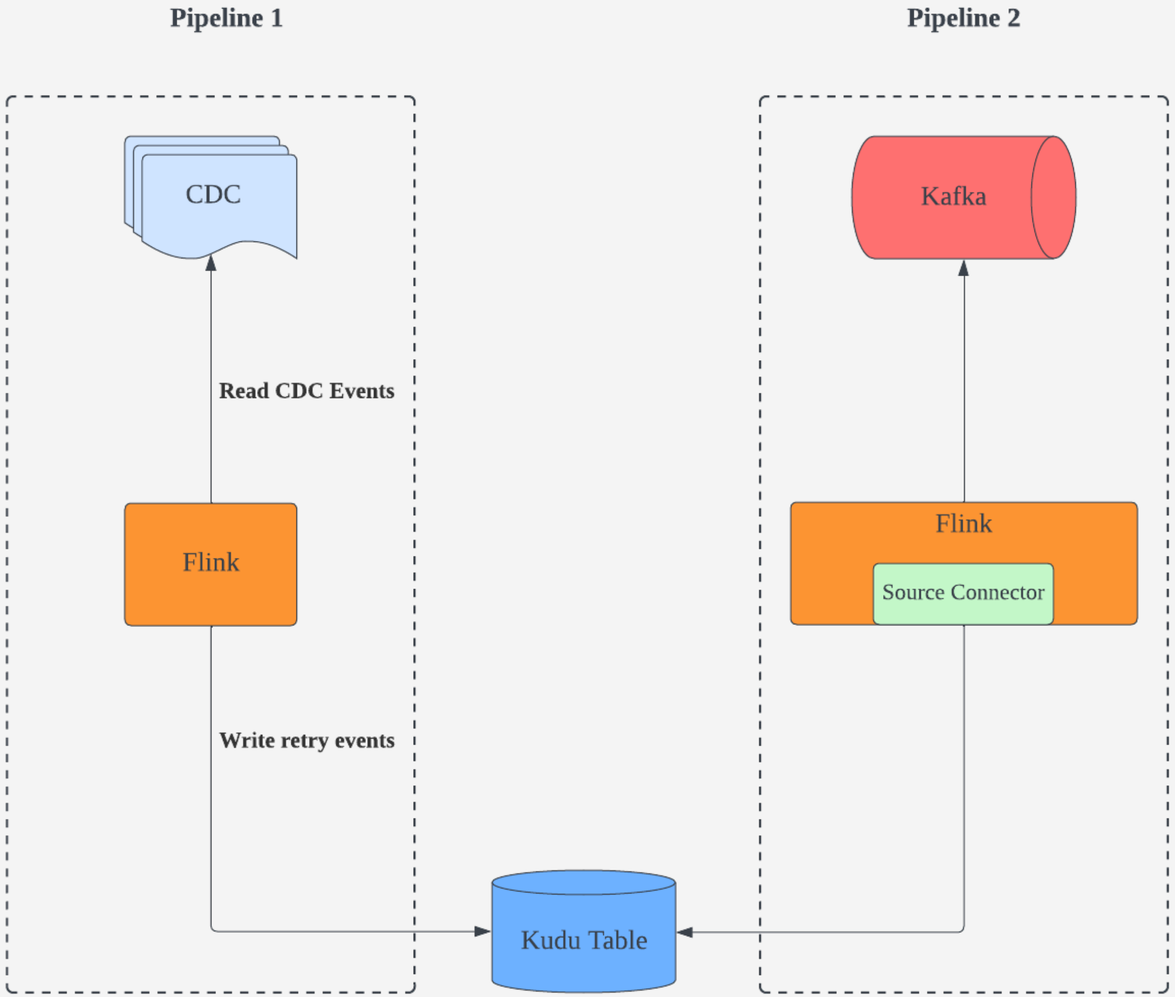
Case Study

A distributed, large scale retry service for notification re-delivery

- Kudu is used as a distributed, fast store for retry candidates
- Retry time is designed to be part of the primary key for retry table for fast query
- Read in customized order



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Part 05

Resources

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Resources

Github: https://github.com/eBay/flink-kudu-streaming-connector

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Thanks

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