

The background of the slide is a light gray map. It features several blue lines, some solid and some dashed, which represent geographical features like rivers or roads. There are also several small blue dots scattered across the map, possibly representing locations or points of interest. The overall style is clean and modern.

KSQL

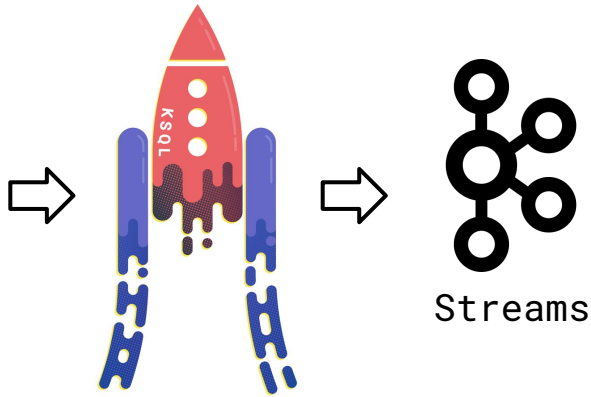
The background of the slide is a light blue map with various wavy lines, some solid and some dashed, and several small blue dots scattered across it. A white rectangular box with a blue border is centered on the slide, containing the title text.

Stream Processing with KSQL

Introduction to KSQL

KSQL transforms SQL queries into Kafka Streams applications

```
CREATE TABLE user(  
  username VARCHAR,  
  email VARCHAR  
) WITH (  
  KAFKA_TOPIC='user_topic',  
  VALUE_FORMAT='json'  
);
```



KSQL Architecture

- Open-sourced in 2018 by Confluent
- Built in Java, Scala and runs on the JVM
- KSQL is built on top of the Java Kafka Streams Library
- Kafka as Changelog, RocksDB for local storage
- Can run interactive and on-demand queries
- Supports REST API, CLI, and File-based querying

Comparing KSQL

- Simpler to write SQL than to build entire custom app
- Great for exploration when exact solution not known
- No need for specific programming language skills
- Comes with logging and metrics out of the box
- Not always easy to use SQL to solve all problems
- Can't import whatever library you want; Supports UDFs

Turning Topics into Tables and Streams

The KSQL CLI can show what topics are available

```
ksql> SHOW TOPICS;
```

Kafka Topic	Registered	Partitions	Partition Replicas	Consumers	ConsumerGroups
purchases	false	1	1	0	0
users	false	1	1	0	0
connect-configs	false	1	1	0	0
connect-offsets	false	25	1	0	0
connect-status	false	5	1	0	0

Creating a Stream

Streams can be created from a Kafka Topic or from a query

```
CREATE STREAM purchases (  
  username VARCHAR,  
  currency VARCHAR,  
  amount INT  
)  
CREATE STREAM purchases_high_value AS  
  SELECT *  
  FROM purchases  
  WHERE amount > 100000;  
VALUES FORMAT = JSON  
)
```

The background of the slide is a light blue map. It features several solid blue lines that curve across the frame, resembling a network of roads or rivers. Interspersed among these solid lines are dashed blue lines. Small, solid blue dots are placed at various points along both the solid and dashed lines. Additionally, there are small, light blue 'x' marks scattered across the map, some of which are positioned near the ends of dashed lines.

Demo: Creating a Stream

Creating a Table

Tables can be created from a Kafka Topic or from a query

```
CREATE TABLE users (  
  username VARCHAR,  
  address VARCHAR, high_value AS  
  SELECT email VARCHAR,  
  FROM purchases phone_number VARCHAR  
  WHERE count > 100000;  
  WITH (  
    KAFKA_TOPIC='purchases',  
    VALUE_FORMAT='JSON',  
    KEY='username'  
  )  
);
```

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Demo: Creating a Table

Querying Syntax

KSQL supports familiar SQL query syntax such as SELECT ... WHERE ...

```
SELECT username  
FROM purchases  
WHERE currency="USD" AND  
amount > 100000
```

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Demo: Querying

The background of the slide is a light blue map with white contour lines. There are several blue dots placed at various points on the map, and some dashed lines with 'x' marks at their ends.

Windowing

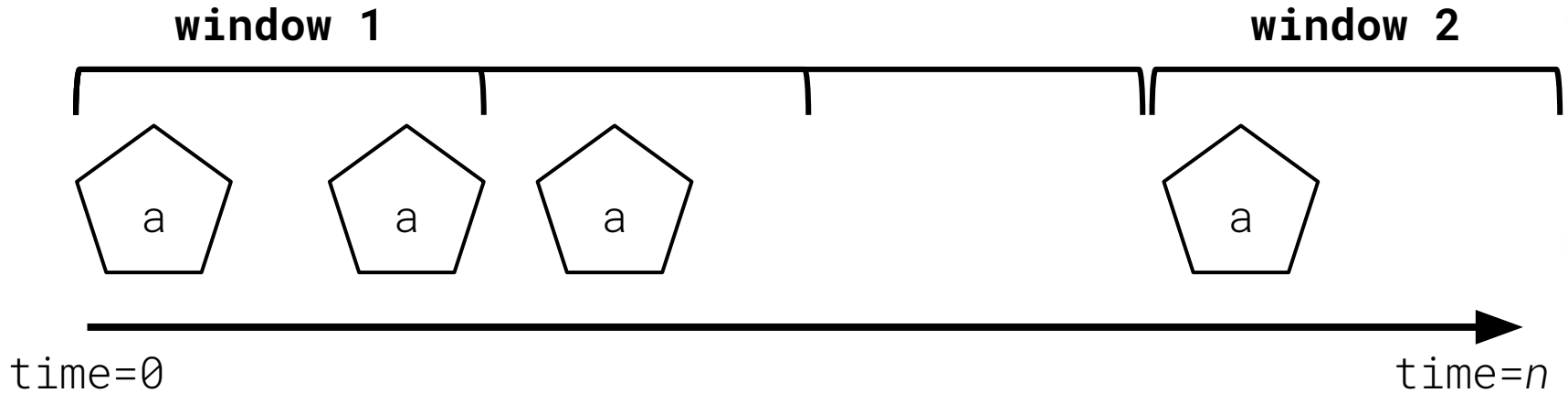
Hopping and Tumbling Windowing

KSQL Supports Tumbling and Hopping Windows on Tables

```
SELECT currency, SUM(amount)
FROM purchase
WINDOW HOPPING (SIZE 10 MINUTES, ADVANCE BY 1 MINUTES)
GROUP BY currency;
```

Session Windowing

Session windows extend indefinitely as long as activity is repeated within the window timeframe



Session Windowing

Session windows extend indefinitely as long as activity is repeated within the window timeframe

```
SELECT currency, SUM(amount)
FROM purchase
WINDOW SESSION (30 MINUTES)
GROUP BY currency;
```


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Demo: KSQL Windowing

Aggregating Data

GROUP BY allows re-partitioning of a stream or table on a new key

```
SELECT currency, SUM(amount)
FROM purchase
WINDOW SESSION (30 MINUTES)
GROUP BY currency;
```

Aggregating Data

GROUP BY allows re-partitioning of a stream or table on a new key

```
SELECT currency, HISTOGRAM(currency)  
FROM purchase  
WINDOW SESSION (30 MINUTES)  
GROUP BY currency;
```

Aggregating Data

GROUP BY allows re-partitioning of a stream or table on a new key

```
SELECT currency, TOPK(amount, 10)  
FROM purchase  
WINDOW TUMBLING (SIZE 1 HOURS)  
GROUP BY currency;
```

The background of the slide features a light blue map-like pattern. It includes several solid blue lines that curve across the frame, and several dashed blue lines, some of which end in small 'x' marks. There are also five solid blue dots scattered across the map. A white rectangular box with a thin blue border and a subtle drop shadow is centered on the slide.

Demo: Aggregating Data

The background of the slide is a light blue map with white contour lines. There are several blue dots placed at various points on the map, and some dashed lines with 'x' marks at their ends. A white rectangular box with a blue border is centered on the slide.

Joins

Joins Overview

KSQL supports JOIN operations on co-partitioned streams and/or tables

```
SELECT p.username, p.amount, u.email  
FROM purchase  
JOIN users u ON p.username = u.username
```



Demo: Hands-on with Joins

The background of the slide features a light blue map with various wavy lines, some solid and some dashed, and several small blue dots scattered across the surface. A white rectangular box with a thin blue border is centered on the slide, containing the word "Summary" in a bold, dark blue font.

Summary

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Summary