Flink Streaming SQL 2018

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Flink Streaming SQL 2018

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Agenda

为何选择 SQL？
Why SQL?
选择 Streaming SQL 将要面对的挑战
Challenges in Streaming SQL
在 Streaming SQL 中连接表的不同方式
Various ways to join tables in Streaming SQL
模式识别
Pattern recognition
其他近期成果
Other recent improvements.

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为何选择 SQL

Why SQL?

众所周知的接口

Well known interface

无需编程——易于上手

No programming is required - easier to learn

申诉式语言表达你的商业逻辑

Declarative way to express your business logic

内建优化

Out-of-the box optimization

选择 Streaming SQL 将要面对的挑战
Challenges in Streaming SQL

批次处理实例
Batch example

```
SELECT
   a.id
FROM
   A a, B b
WHERE
   a.id = b.id
```

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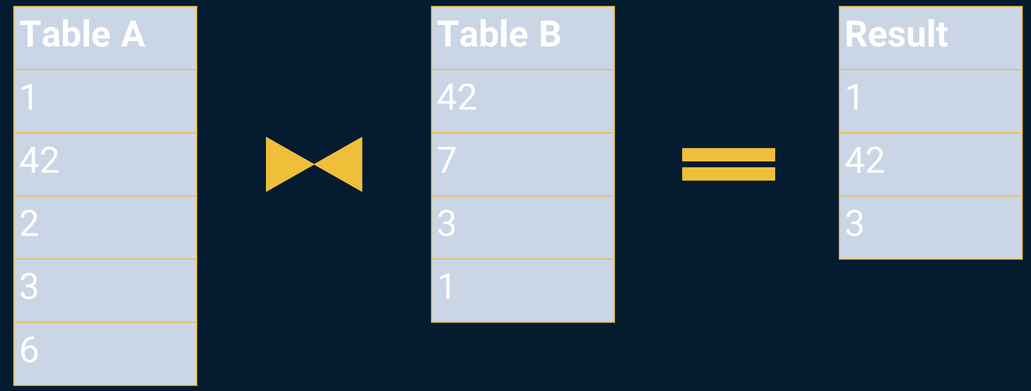
SELECT a.id FROM A a, B b WHERE a.id = b.id



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归并连接算法

Sort-Merge Join

Table A
1
42
2
3
6

Table B
42
7
3
1

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第一步 — 分类

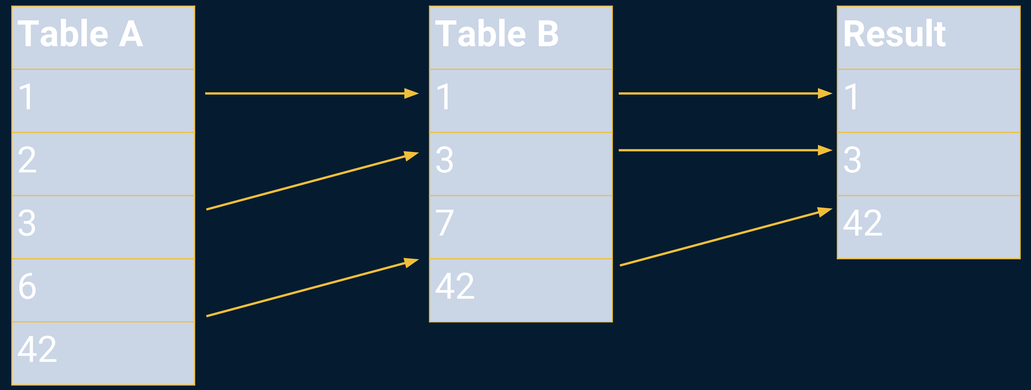
First step - Sort

Table A
1
2
3
6
42

Table B
1
3
7
42

第二步 合并及连接

Second step Merge and Join



多表连接算法

Hash Join

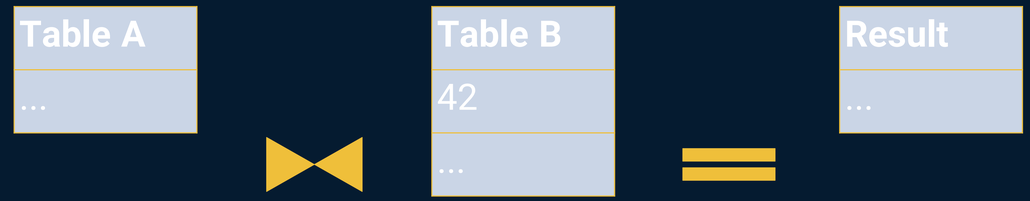
Table A
1
42
2
3
6

Table B
42
7
3
1

Result
1
42
3

连接连续查询

Join in continuous queries



连接连续查询

Join in continuous queries

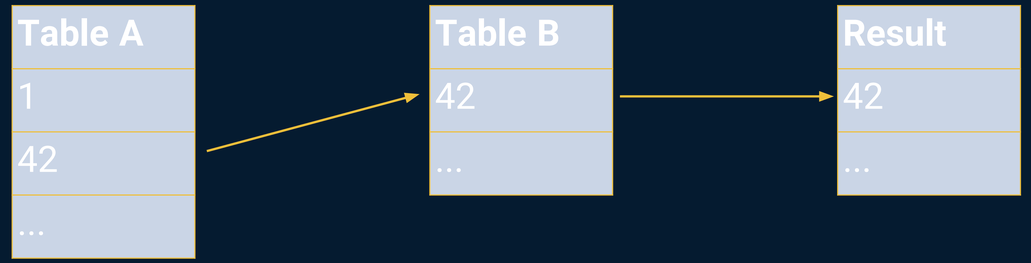
Table A
1
...

Table B
42
...

Result
...

连接连续查询

Join in continuous queries



连接连续查询

Join in continuous queries

Table A
1
42
...

Table B
42
7
...

Result
42
...

连接连续查询

Join in continuous queries

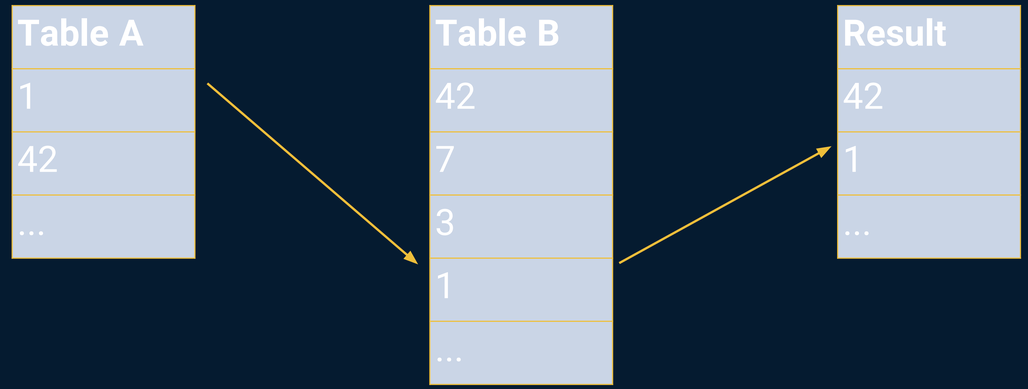
Table A
1
42
...

Table B
42
7
3
...

Result
42
...

连接连续查询

Join in continuous queries



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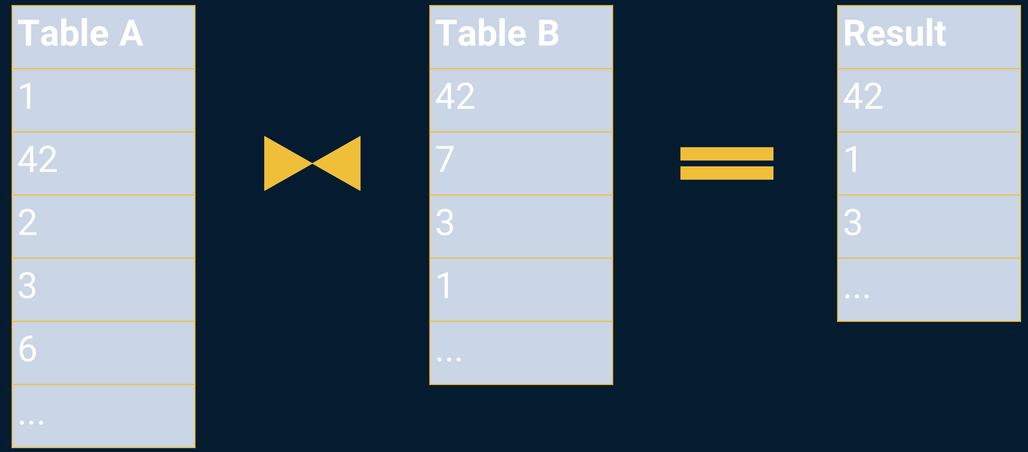
连接连续查询

Join in continuous queries



时间窗口连接
Time-windowed Join

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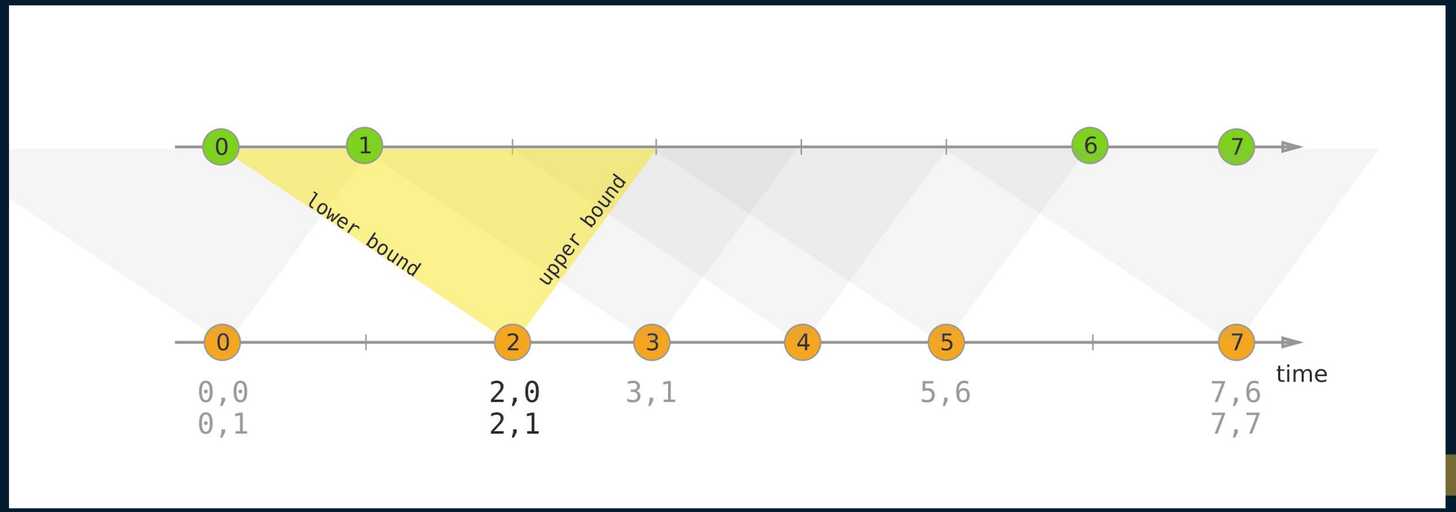
水位线
Watermarks

时间窗口连接
Time-windowed Join

```
SELECT
  *
FROM
  Orders o, Shipments s
WHERE
  o.id = s.orderId AND
  s.shiptime BETWEEN o.ordertime AND o.ordertime + INTERVAL '4' HOUR
```

时间窗口连接
Time-windowed Join



历史表
Temporal Tables

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SELECT * FROM RatesHistory;

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	102
09:00	Euro	114
09:00	Yen	1
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

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RatesHistory

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	102
09:00	Euro	114
09:00	Yen	1
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

```
TemporalTableFunction rates =
   ratesHistory
      .createTemporalTableFunction(
         "time",
         "currency");


tableEnv.registerFunction("Rates", rates);
```

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RatesHistory

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	**102**
09:00	Euro	**114**
09:00	Yen	**1**
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

SELECT * FROM Rates('10:15');

时间 **time**	**货币** **currency**	**汇率** **rate**
09:00	USD	**102**
09:00	Euro	**114**
09:00	Yen	**1**

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RatesHistory

时间 time	货币 currency	汇率 rate
09:00	USD	102
09:00	Euro	114
09:00	Yen	1
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

SELECT * FROM Rates('11:50');

时间 time	货币 currency	汇率 rate
11:49	USD	99
11:15	Euro	119
09:00	Yen	1

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RatesHistory

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	102
09:00	Euro	114
09:00	Yen	1
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

Orders

时间 **time**	货币 **currency**	量 **amount**
10:15	Euro	2
10:00	Yen	50
11:35	Euro	2
...	...	...

历史表连接
Temporal Table Join

```
SELECT
  o.amount * r.rate
FROM
  Orders o,
  LATERAL TABLE (Rates(o.time)) r
WHERE
  o.currency = r.currency
```

```
SELECT o.amount * r.rate
FROM
   Orders o,
   LATERAL TABLE (Rates(o.time)) r
WHERE
   o.currency = r.currency
```

RatesHistory

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	102
09:00	**Euro**	**114**
09:00	Yen	1
10:45	Euro	116
11:15	Euro	119
11:49	USD	99
...	...	...

Orders

时间 **time**	货币 **currency**	量 **amount**
10:15	**Euro**	**2**
...	...	...

Result

汇率 * 量 **rate * amount**
228
...

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```
SELECT o.amount * r.rate
FROM
   Orders o,
   LATERAL TABLE (Rates(o.time)) r
WHERE
   o.currency = r.currency
```

RatesHistory

时间 **time**	货币 **currency**	汇率 **rate**
09:00	USD	102
09:00	Euro	114
09:00	Yen	1
10:45	Euro	116
11:15	**Euro**	**119**
11:49	USD	99
...	...	...

Orders

时间 **time**	货币 **currency**	量 **amount**
10:15	Euro	2
10:00	Yen	50
11:35	**Euro**	**2**
...	...	...

Result

汇率 * 量 **rate * amount**
228
50
238
...

常见连接
Regular joins

语法
Syntax

SELECT * FROM A a, B b WHERE a.id = b.id

范围
Scope

两个表格对彼此完全可见
All rows from both tables visible to each other

内存
Memory

所有记录必须无限期保存
All records must be persisted indefinitely

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时间窗口连接
Time-windowed Joins

语法 Syntax	SELECT * FROM A a, B b WHERE a.id = b.id AND a.time BETWEEN b.time AND b.time + 1 `DAY`
范围 Scope	所有行在被定义的时间窗口中可见 Rows visible within a defined time window
内存 Memory	所有记录在现在和窗口长度之间(加上水位线延迟) All records between now and window length (plus watermark delay)

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历史表连接
Temporal Table Joins

语法
Syntax

```
SELECT * FROM A a, LATERAL TABLE (B(a.time))
WHERE a.id = b.id
```

范围
Scope

只对给定的B的最新版本可见 a.time
Visible is only the latest version of B for given a.time

内存
Memory

表格B：所有B的版本在现在和水位线延迟之间
Table B: all versions of B between now and watermark delay
表格A：所有记录在现在和水位线延迟之间
Table A: all records between now and watermark delay

模式识别

Pattern recognition

模式识别
Pattern recognition

示例 :

Examples:

- (S M{2,} E)
- (A B+ C* D)
- (START_ROW PRICE_DOWN+ PRICE_UP)

```
SELECT * FROM Ticker
MATCH_RECOGNIZE (
    PARTITION BY symbol
    ORDER BY rowtime
    MEASURES
        B.price AS endPrice,
        COUNT(A.price) AS count
    ONE ROW PER MATCH
    AFTER MATCH SKIP TO FIRST B
    PATTERN (A+ B)
    DEFINE
        A AS AVG(A.price) < 15)
```

```
SELECT * FROM Ticker
MATCH_RECOGNIZE (
    PARTITION BY symbol
    ORDER BY rowtime
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```
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MATCH_RECOGNIZE (
    PARTITION BY symbol
    ORDER BY rowtime
    MEASURES
        B.price AS endPrice,
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    ONE ROW PER MATCH
    AFTER MATCH SKIP TO FIRST B
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    DEFINE
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```

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模式识别
Pattern recognition

MATCH_RECOGNIZE 从句与 GROUP BY 有一些相似之处
MATCH_RECOGNIZE clause has some similarities with GROUP BY
是 SQL 2016 标准的一部分
It is a part of the SQL 2016 standard

其他成果
Other work

SQL Client

Flink SQL 的命令行接口
Command line interface for Flink SQL
无编程需要
No programming required

进行中的项目
Ongoing work

连接器和格式:
Connectors & formats

SQL Client

外部目录支持:
External catalog support

THANKS