Apache Flink® - Redefining Computation

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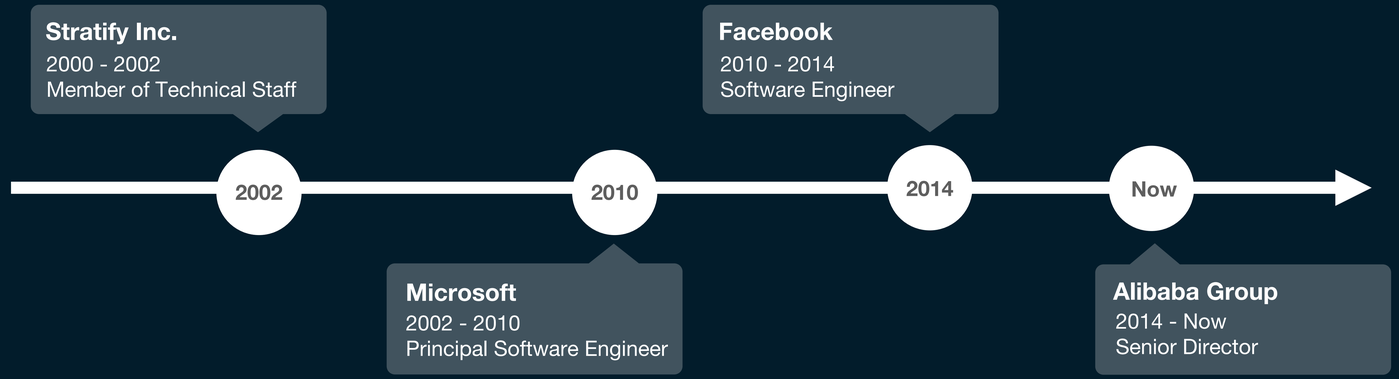
Senior Director

Alibaba

FLINK FORWARD



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聚划算 淘宝网 Taobao.com 天猫 TMALL.COM 阿里云 aliyun.com Alibaba Group 支付宝 ALIPAY CAINIAO 菜鸟 AliExpress

EB Total

PB Everyday

1T Event/Day

1.7B Events/sec

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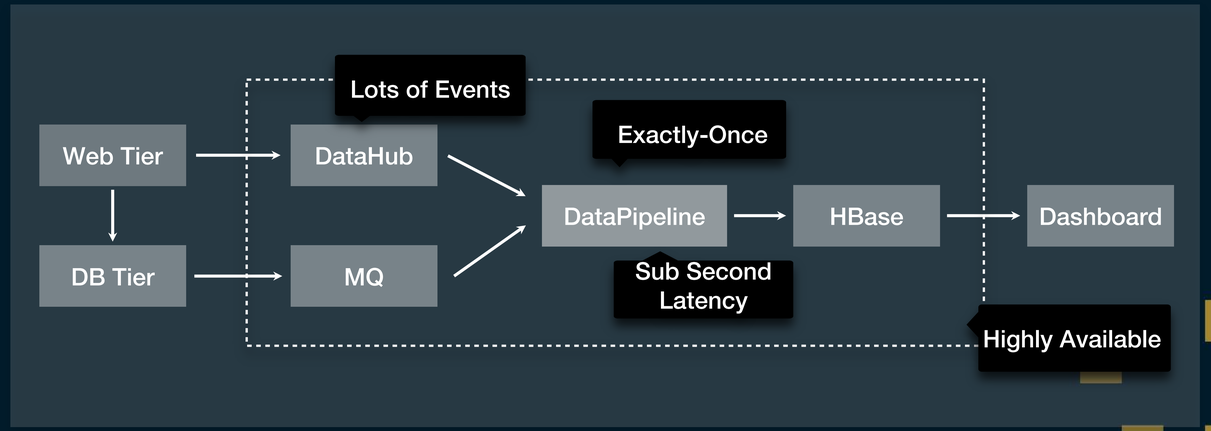
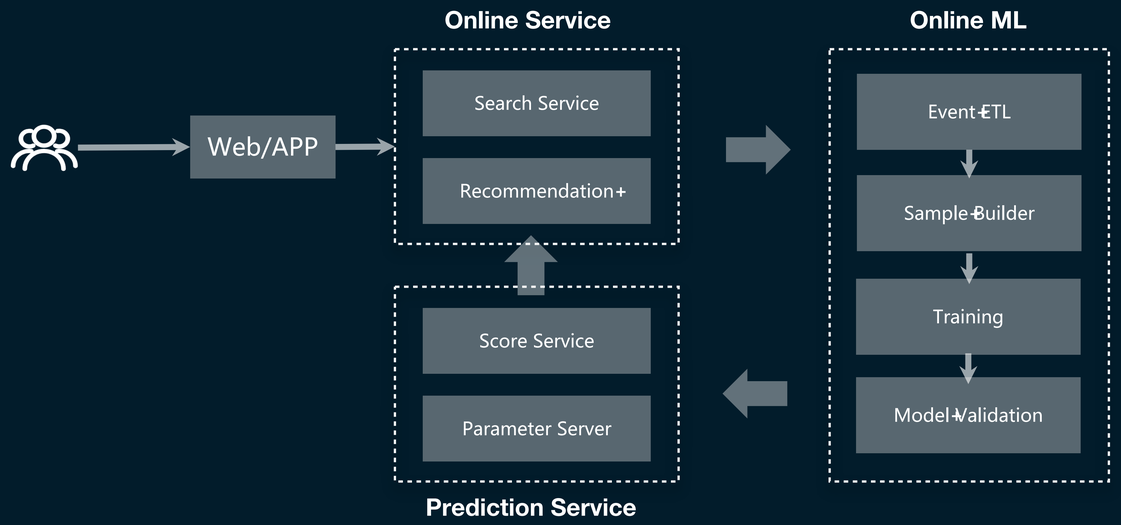
1. Stream Processing


2018天猫双11全球狂欢节
24:00:00
2018年天猫双11
成交额
2135


Lots of Events
Web Tier
DB Tier
DataHub
MQ
Exactly-Once
DataPipeline
HBase
Dashboard
Sub Second Latency
Highly Available



Real-Time Personalization

Large Scale: 100 Millions of Events、100 Billions of Features

Low Latency: Second Latency from End to End

Complex Logic: Real-Time Training, Feature/Model Update

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What is Flink

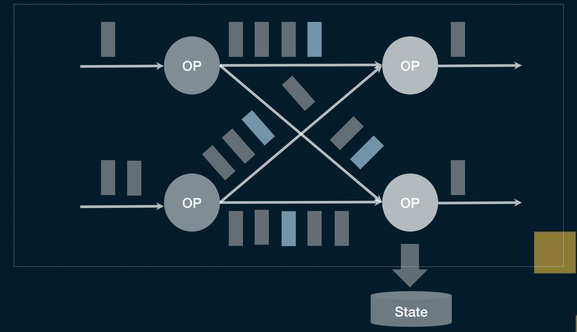
An open source stream processing framework that unifies real-time event-driven applications and real-time analytics.

Flink Program

```
>_

SELECT
  word, count(*)
FROM
  stream
GROUP BY
  word;
```

Flink DAG



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Flink Stream Process

Exactly-Once

High Throughput

Low Latency

Fault Tolerant

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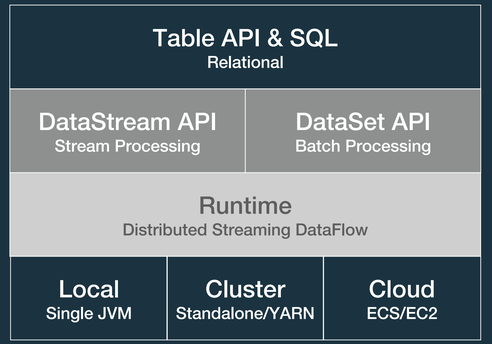

Flink Architecture

Flink Runtime Improvements

Distributed Architecture
Rework Cluster Management [FLIP-6/FLINK-4319]

Fault Tolerance
JobManager Failover [FLINK-4911]
Region-based Task Failover [FLIP1/FLINK-4256]

Performance
Incremental Checkpoint [FLINK-5053]
Async I/O [FLIP12/FLINK-4391]
Credit-based Flow Control [FLINK-7282]

Flink SQL Improvements

Semantics

Functionality
Agg/w Retraction
Window
UDX Support
DDL Support
Connector Support

SQL

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Status of Production

Subsecond Latency

Billions Events/sec

Ten Thousand Nodes

Ten Thousand Jobs

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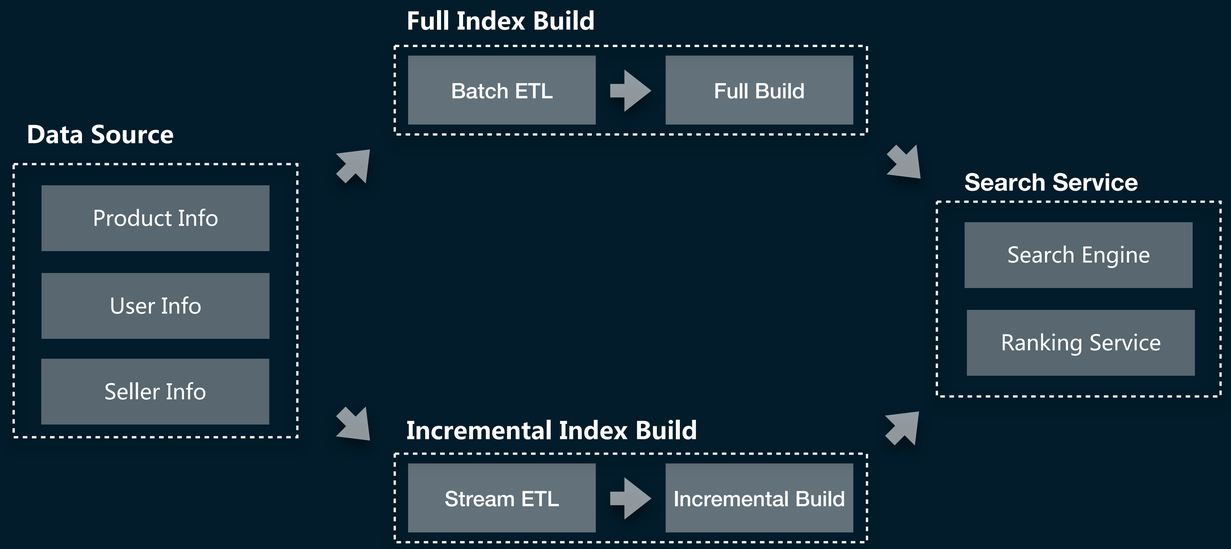
2. Unified Engine



Index Pipelines for Search

Development Efficiency: Full/Incremental Index Build

Challenge: Consistency

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Low Latency
Fixed Query

Stream Processing

Periodic/Continuous
Batch Jobs

Progressive Processing

High Throughput
Flexible Query

Batch Analytics

Streaming as the **core abstraction**, Batch as a **special case** of streaming

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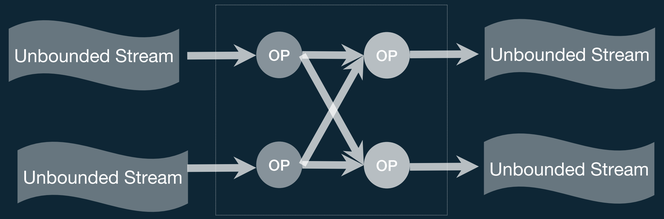
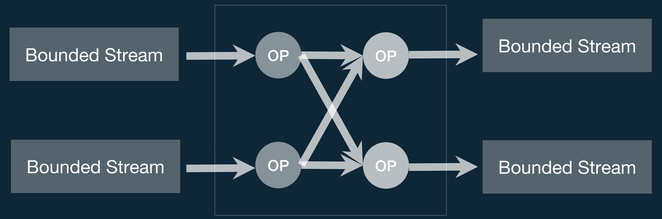
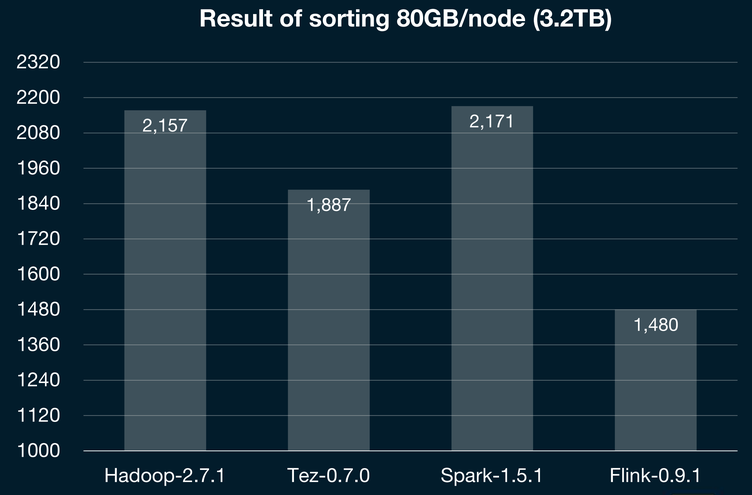
Stream Job



Batch Job





Flink is the fastest due to its pipelined execution

Tez and Spark do not overlap 1st and 2nd stages

MapReduce is slow despite overlapping stages

A Comparative Performance Evaluation of Flink, Dongwon Kim, POSTECH, Flink Forward 2015


Table API & SQL
Relational
DataStream API
Stream Processing
DataSet API
Batch Processing
Runtime
Distributed Streaming DataFlow
Local
Single JVM
Cluster
Standalone/YARN
Cloud
ECS/EC2
Old Design
DataStream
API
TableAPI
Relational
SQL
Relational
Query Processor
Query Optimization & Query Execution
Runtime
DAG API & Stream Operators
Local
Single JVM
Cluster
Standalone/YARN
Cloud
ECS/EC2
New Design

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Improvements in New Design

Runtime

New Operator Framework
Customizable Scheduling
Flexible Chaining

Query Execution

Expression Optimizations
Performant Operators
Resource Optimizations

Query Optimizer

Cost Based
Advanced Rules
Rich Stats

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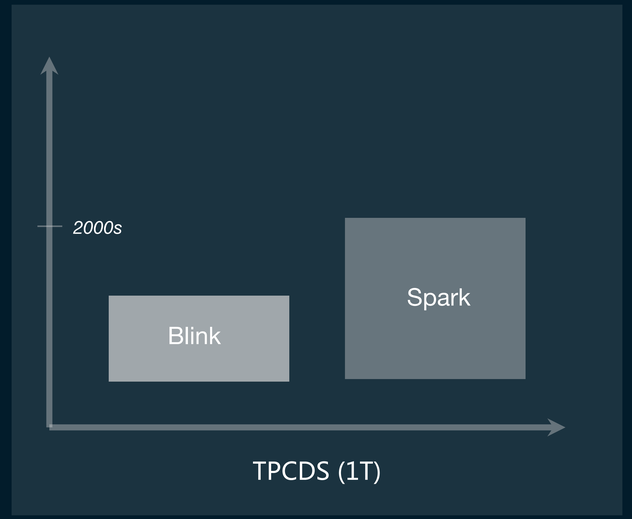
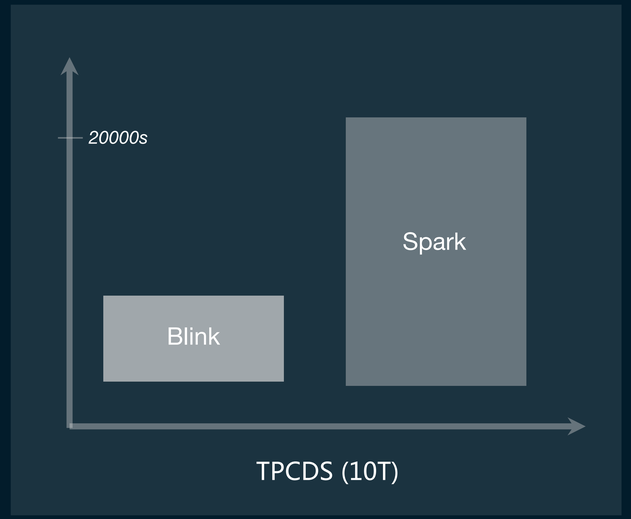
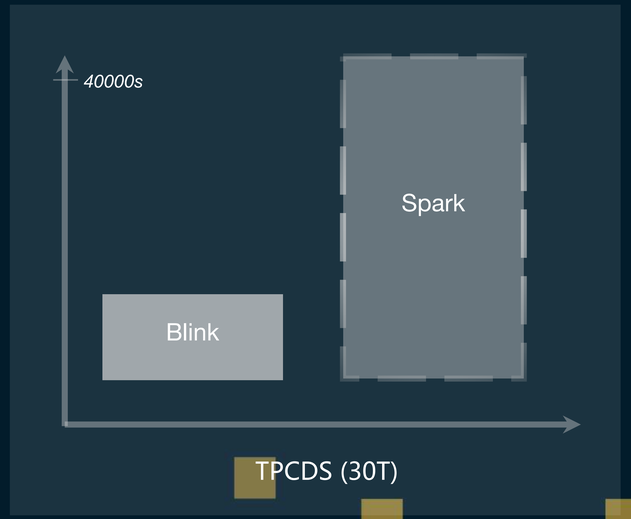
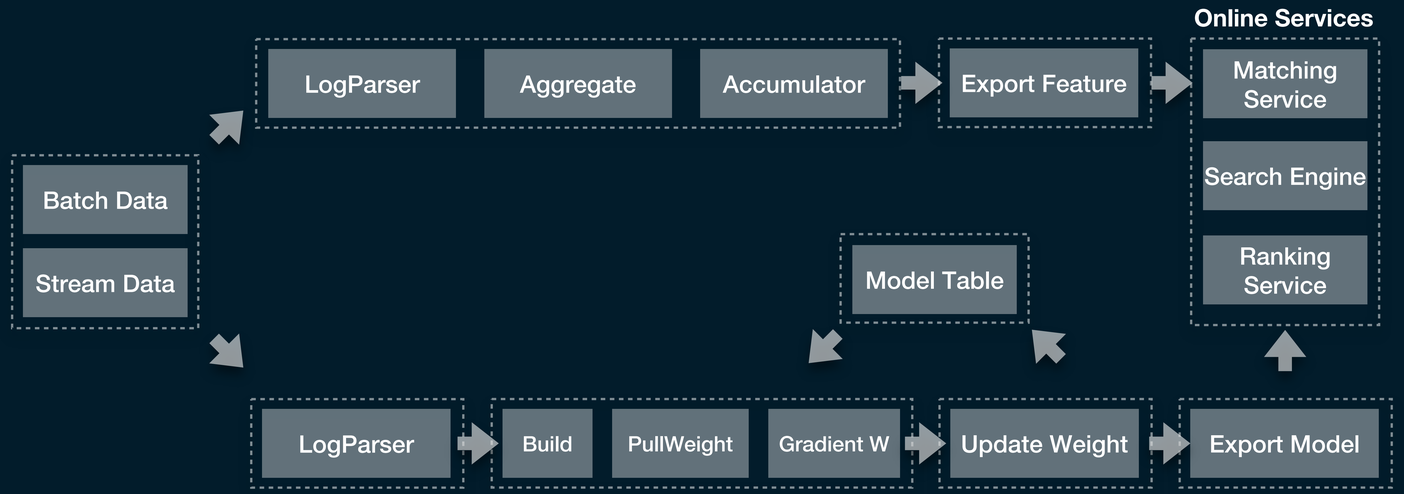
TPC-DS Performance *(the Lower, the Better)*







Spark选用社区2.3.1版本



Search’ s Algorithm Platform

Unified Pipeline for Batch & Streaming
Streaming: 100M QPS, 100B features
Batch: Over 400TB in a single job

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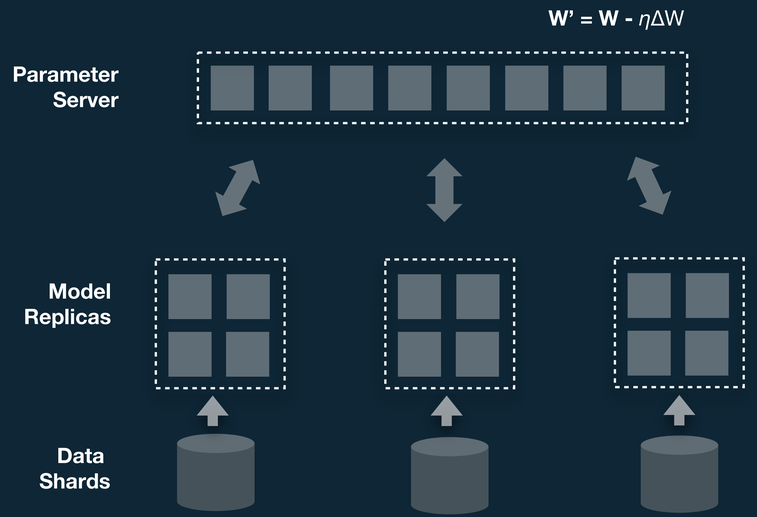
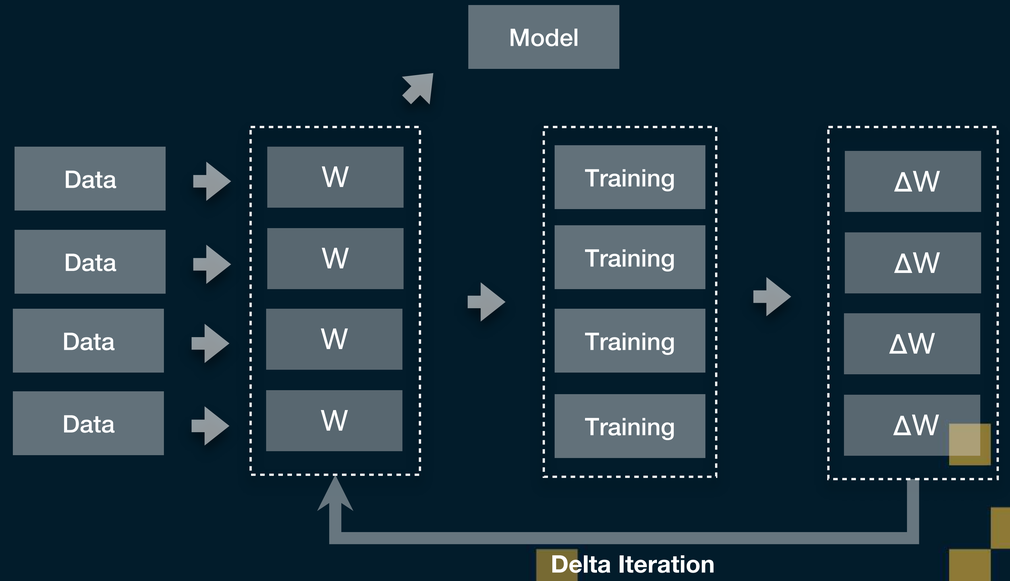
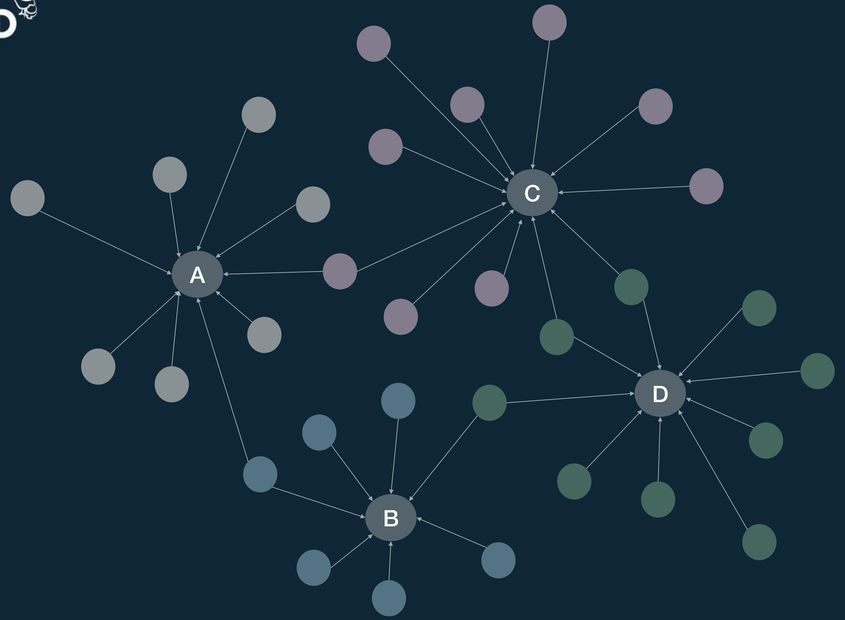
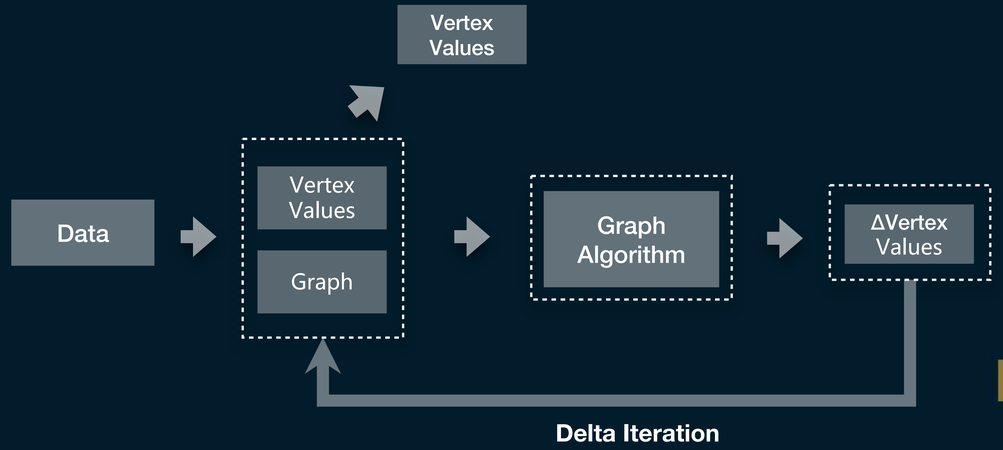
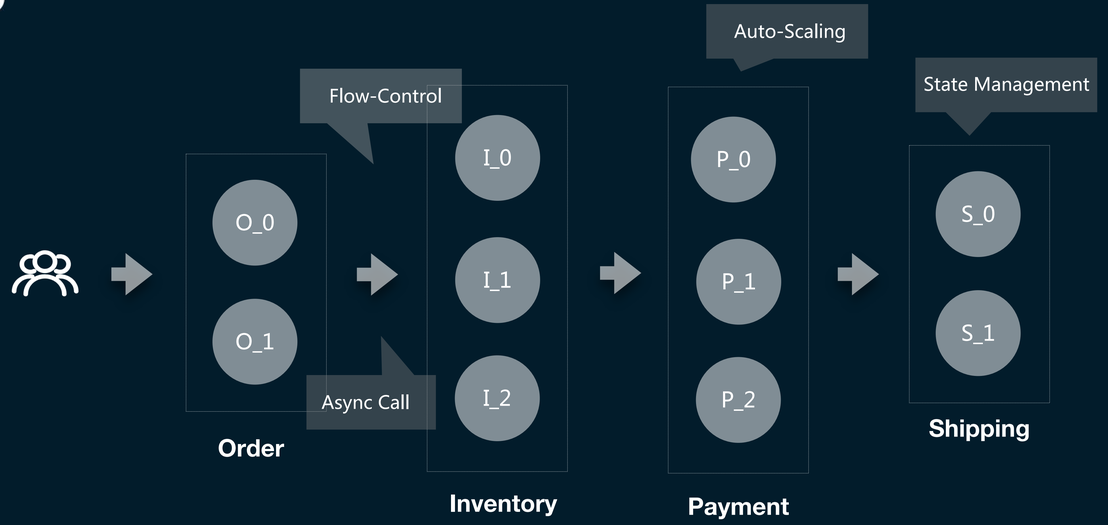
3. Future


W' = W - ηΔW
Parameter Server
Model Replicas
Data Shards


Model
Data
Data
Data
Data
W
W
W
W
Training
Training
Training
Training
ΔW
ΔW
ΔW
ΔW
Delta Iteration


A
B
C
D


Vertex Values
Data
Vertex Values
Graph
Graph Algorithm
ΔVertex Values
Delta Iteration



MicroService

Event Driven/Async Processing
Back Pressure & Flow Control
Auto-Scaling
State-Management & Atomicity

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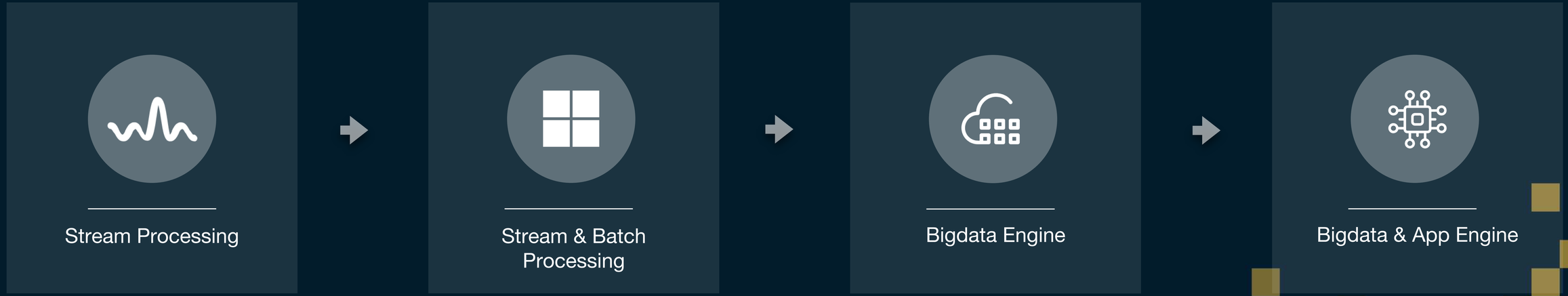
Apache Flink – Streaming Technology Redefining Computation



THANKS