Experience of Using Hudi in ByteDance's Recommendation System

Ziyue Guan
Translated by **Y Ethan Guo**

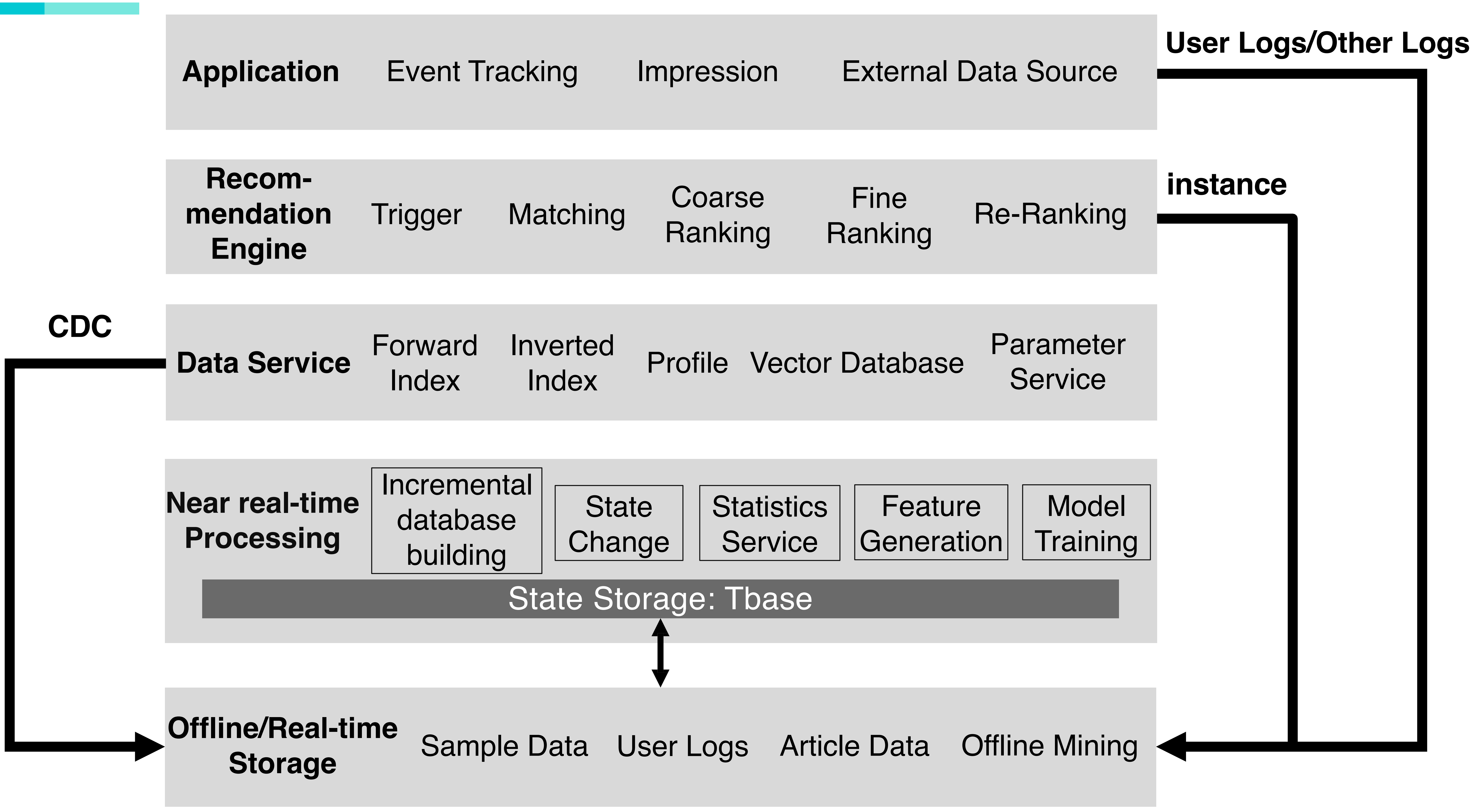
ByteDance

Agenda

01 Scenario Requirements

- BigTable CDC
- Feature Engineering

Scenario Requirements



Scenario Requirements

BigTable CDC

- CDC for flat-wide table database
- Provide efficient OLAP query
- Provide online compatible data sync
- Irregular data (size, format)
- Requirements are diverse

Feature Engineering

- The splicing of instance and label
- Provide access to efficient IO for model pruning
- High-dimensional complex data (ten thousands of columns, nested types, sparse)
- High throughput and near real-time write (100 GB/s)
- EB-level storage

02 Design Decisions

- Multiple data lake engines
- MOR or COW
- Index type
- Compute engine

Design Decisions

01 **Data lake selection**	**Iceberg:** Good data abstraction and excellent interface design **Hudi:** Flexible interface implementation, global index, MOR **DeltaLake:** Strong binding with spark
02 **Real-time write**	**COW or MOR**
03 **Index type**	**Simple Bloom HbaseIndex**
04 **Compute engine**	**Spark or Flink | RDD API or DataSource API**

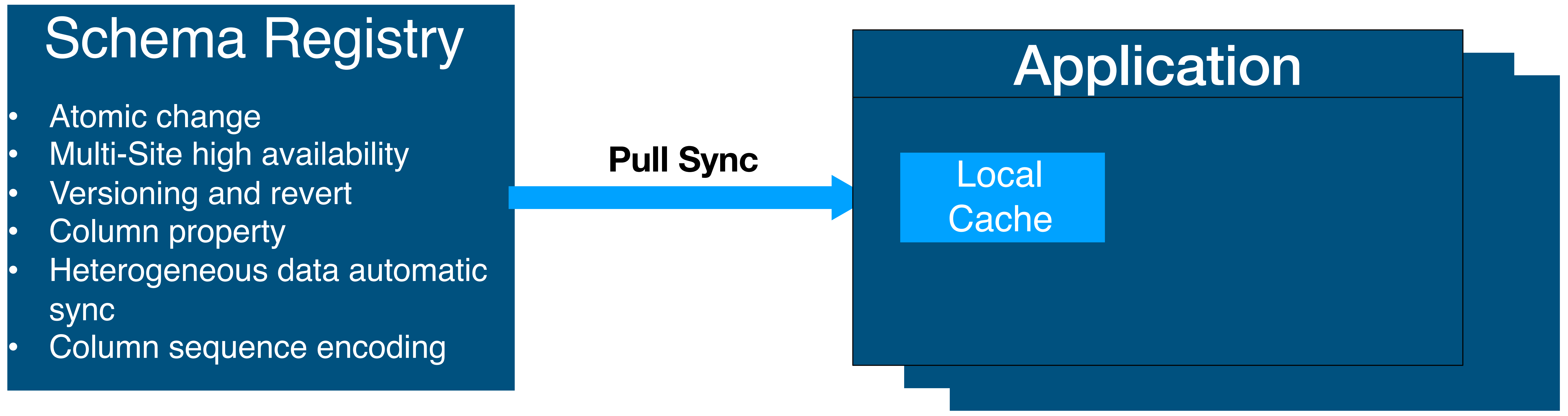
03 Functionality Support

- MVCC
- Schema registration system

MVCC

- Payload
- Custom data structure
- Timestamp
- View Access
- Append

Schema


Schema Registry
Atomic change
Multi-Site high availability
Versioning and revert
Column property
Heterogeneous data automatic sync
Column sequence encoding
Pull Sync
Application
Local Cache

04 Performance Tuning

- Serialization
- Compaction HDFS
- SLA
- Process optimization

Serialization

State of the art

- 1000-10000+ columns
- Average column length of 20 characters
- Single row of 10MB+
- Resolver 4G+
- Serialization time 30%+

1

Rename columns as IDs

Global singleton of schema object

2

Reduce the number of deserialization

Tuning GC

3

PreCompile Implementation*

Fix code length exceed

https://github.com/linkedin/avro-util *

Compaction

State of the art

- **Inline**
- **Long time**
- **Inflexible resources**

1

Independent resource scheduling

Use cheap resources

2

Rules + heuristic scheduling *

3

Process and memory usage optimization

HDFS SLA

1

Hflush or Hsync

2

Aggressive retry strategy

Slicing upon timeout/rollover

3

Independent cluster

Process Optimization

Some small process optimizations and bug fixes

- Avoid rewrite operations
- Plug-in record size evaluation
- Small file evaluation based on row count
- Simple adaptive execution to avoid write skew
- Custom partitioner to optimize shuffle
- Bulkinsert indexing bulkload
- Timeline cache inconsistent update

05 Future Work

- Productization
- Support for ecosystem
- Cost optimization
- Performance optimization
- Storage semantics

Future Work

1

Productization

User-friendly programming

Operability and maintainability

Simplified tuning

2

Support for ecosystem

Flink

Cross-language, cross-framework format

Universal access

Internal ecosystem improvement

3

Cost optimization

Tiered storage for cold and warm data

Serialization optimization

Mixed tidal compute

Optimize compaction method

4

Performance optimization

Fast machine

Vectorization

New format index process

Workflow reconstruction

5

Storage semantics

Incremental trigger

Mutate

Check and scan

Data reorganization

Q&A

Q&A Time

We are hiring!

字节跳动推荐架构团队

- 负责抖音、今日头条、西瓜视频等产品的推荐架构的设计和开发，保障系统稳定和高可用；
- 负责在线服务、离线数据流性能优化，解决系统瓶颈，降低成本开销；
- 抽象系统通用组件和服务，建设推荐中台、数据中台，支撑新产品快速孵化以及为ToB赋能；
- 设计和实现高并发、高吞吐的服务框架、RPC框架，为业务提供快速构建服务以及高性能在线serving能力；
- 实现灵活可扩展的高性能存储系统和计算模型，打通离在线数据流，构建统一的数据中台，支持推荐/搜索/广告；

团队目前招聘以下岗位：

- 大数据开发工程师
  深入了解大数据生态组件的原理
- 存储研发工程师
  熟悉rocksdb/Hbase, 熟悉分布式存储
- 推荐/搜索/广告相关推荐架构工程师、后端开发工程师
- 深度学习框架研发
- devops/研发效能/编译优化
- 网络通信组件/rpc开发
- 运维工程师

工作地点：北京/上海/杭州/新加坡/山景城

欢迎自荐&推荐，岗位相关问题欢迎私戳微信或将简历投递至邮箱
guanziyue.gzy@bytedance.com

THANKS.

ByteDance 字节跳动