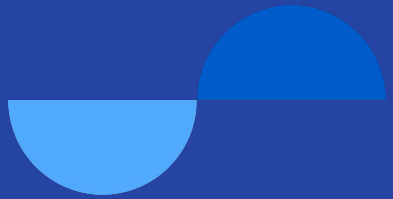
Databend

Rebuilding a Data Warehouse for Everyone

bohutang@datafuselabs.com
May 2022



Databend

Bohu TANG (张雁飞)

Co-founder of Datafuse Labs

A startup that focuses on building the world's best data cloud on top of the open-source project Databend.

MySQL Kernel | Distributed Database | Data Warehouse

https://bohutang.me/

Databend

Agenda

01 Dream Data Warehouse

02 Traditional Data Warehouse

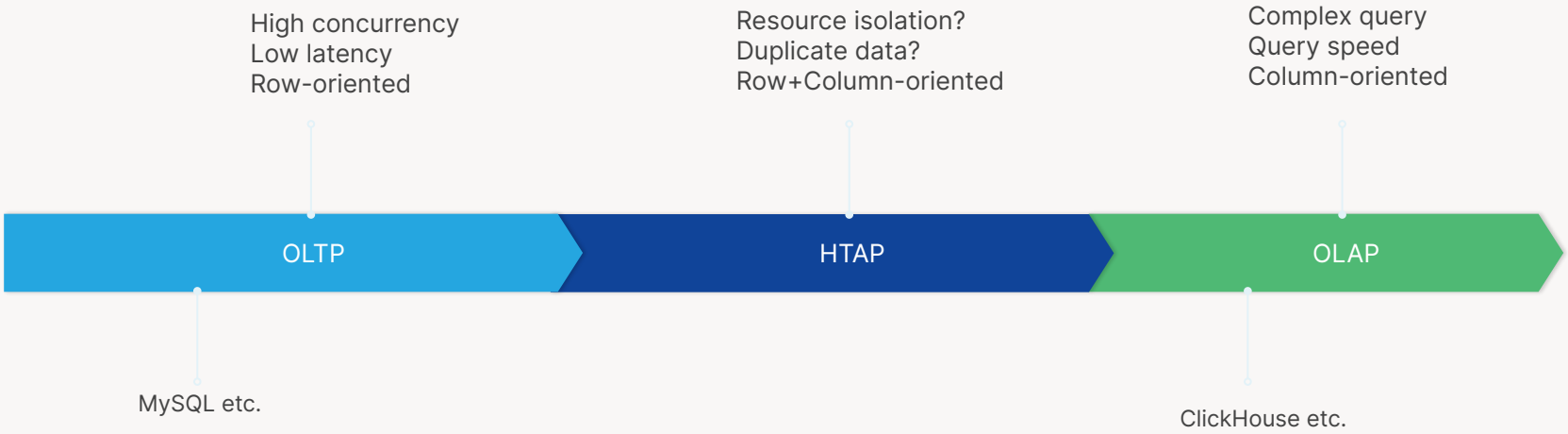
03 Modern Data Warehouse

04 Rebuilding a Data Warehouse

05 Hello, Cloud Data Warehouse!

Database and Data Warehouse

Databend



Databend

01

A Dream Data Warehouse

Databend

Users' Perspectives

- L1: No hardware to install or maintain 

- L2: No software to install, configure, or manage 

- L3: No management, upgrades, or tuning required 

- L4: Elasticity: Instant scaling up and down 

- L5: Pay-as-you-use: Low cost 

- L6: Life getting easier: Everyone can handle 

Databend

Providers' Perspectives

- Instant elasticity: Completely separate storage from computing
- Blazing fast: On-demand performance and concurrency
- All data stored: Structured and unstructured
- No data silo: Data shared between everyone
- Easy to use: no indexing, no tuning, no pre-sharding any data
- Time travel, zero copy cloning table

Databend

Technology Perspectives

- More than a database …
- A very complex system!
- Many complex technologies involved!

Databend

02

Traditional Data Warehouse

Table Partitioning

Table Partitioning (Shared-nothing) is to distribute the table rows across multiple storage devices:

- Spreading I/O load
- Parallel execution
- With hash or range expression

```
CREATE TABLE visits
(
    VisitDate Date,
    Hour UInt8,
    ClientID UUID
)
ENGINE = MergeTree()
PARTITION BY toYYYYMM(VisitDate)
ORDER BY Hour;
```

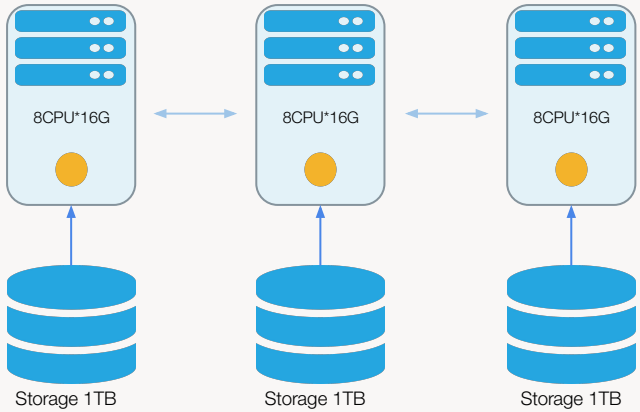
```
┌─partition─┬─name──────────────┬─active─┐
│ 201901    │ 201901_1_3_1      │      0 │
│ 201901    │ 201901_1_9_2_11   │      1 │
│ 201901    │ 201901_8_8_0      │      0 │
│ 201901    │ 201901_9_9_0      │      0 │
│ 201902    │ 201902_4_6_1_11   │      1 │
│ 201902    │ 201902_10_10_0_11 │      1 │
│ 201902    │ 201902_11_11_0_11 │      1 │
└───────────┴───────────────────┴────────┘
```

ClickHouse Custom Partitioning Key

Traditional Architecture

Databend

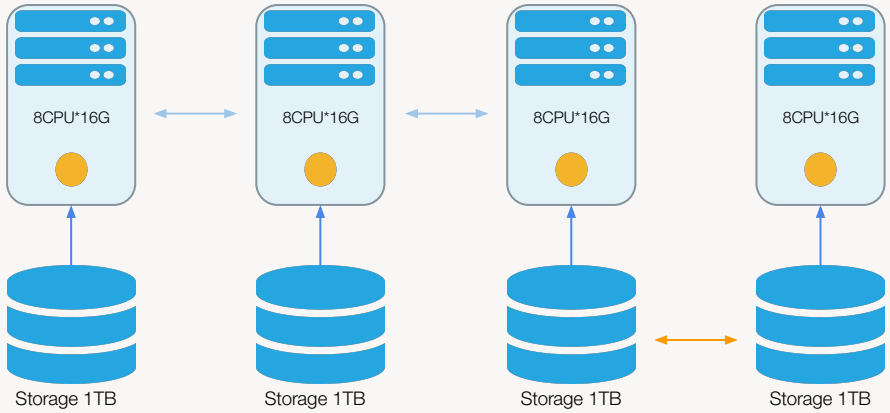
- Shared-nothing
- Computing (CPU/Memory) and storage locked together
- Resource allocation coarse-grained



Traditional Architecture

Databend

- Shared-nothing
- Computing (CPU/Memory) and storage locked together
- Resource allocation coarse-grained



Traditional Architecture

Databend

- Shared-nothing - No elasticity
- Computing (CPU/Memory) and storage locked together - No elasticity
- Resource allocation coarse-grained - No elasticity

Databend

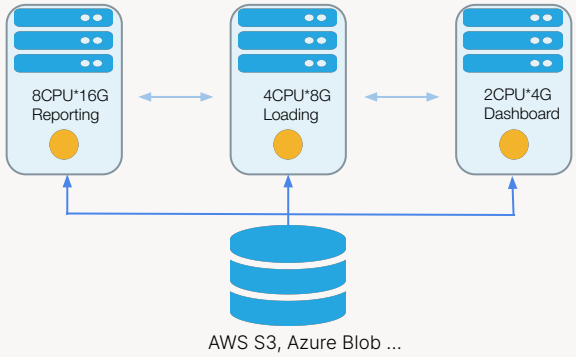
03

Modern Data Warehouse

Modern Architecture

Databend

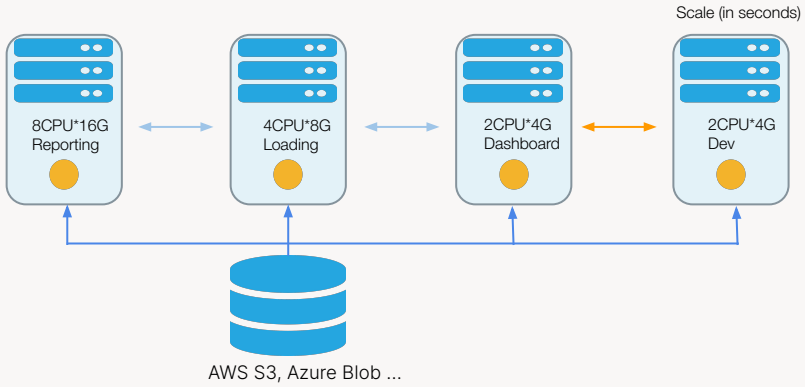
- Shared-storage (Amazon S3, Azure Blob …)
- Computing resources (CPU/Memory) and storage disaggregated
- Resource allocation fine-grained
- Instant scaling up or down



Modern Architecture

Databend

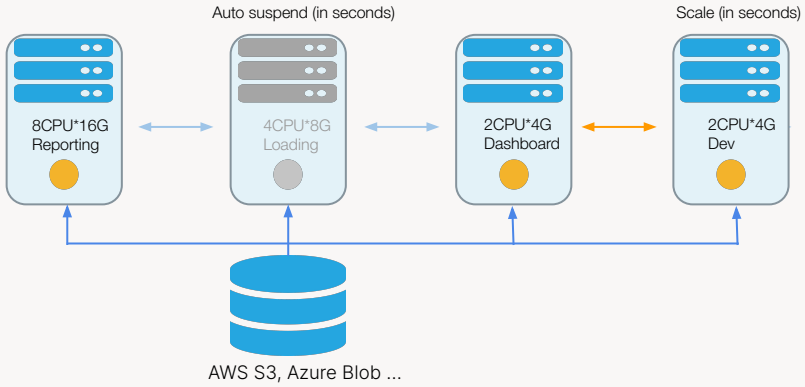
- Shared-storage (Amazon S3, Azure Blob …)
- Computing resources (CPU/Memory) and storage disaggregated
- Resource allocation fine-grained
- Instant scaling up or down



Modern Architecture

Databend

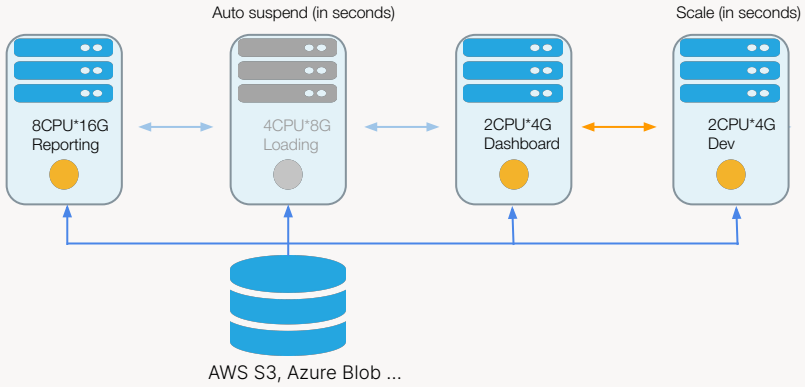
- Shared-storage (Amazon S3, Azure Blob …)
- Computing resources (CPU/Memory) and storage disaggregated
- Resource allocation fine-grained
- Instant scaling up or down



Modern Architecture

Databend

- Shared-storage (Amazon S3, Azure Blob …) - Instant elasticity
- Computing resources and storage disaggregated - Instant elasticity
- Resource allocation fine-grained
- Instant scaling up or down



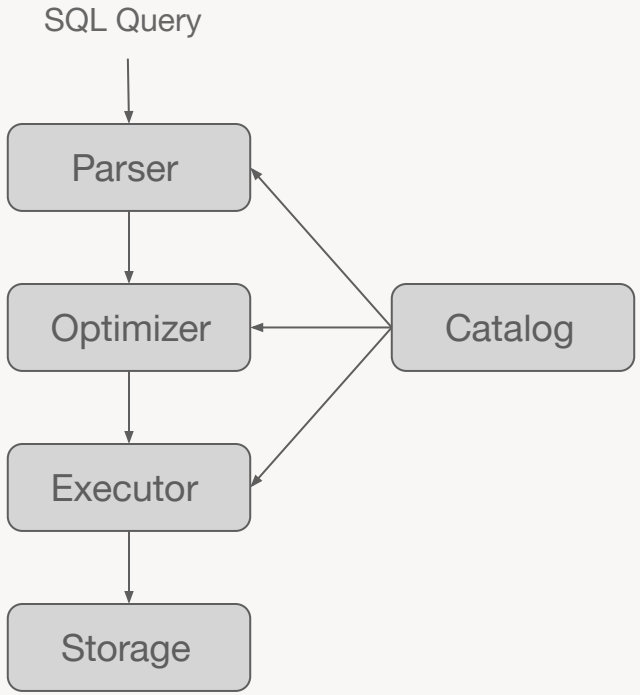
Databend

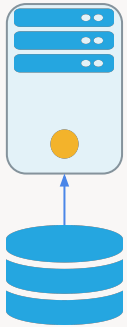
04

Rebuilding a Data Warehouse

Data Warehouse Components

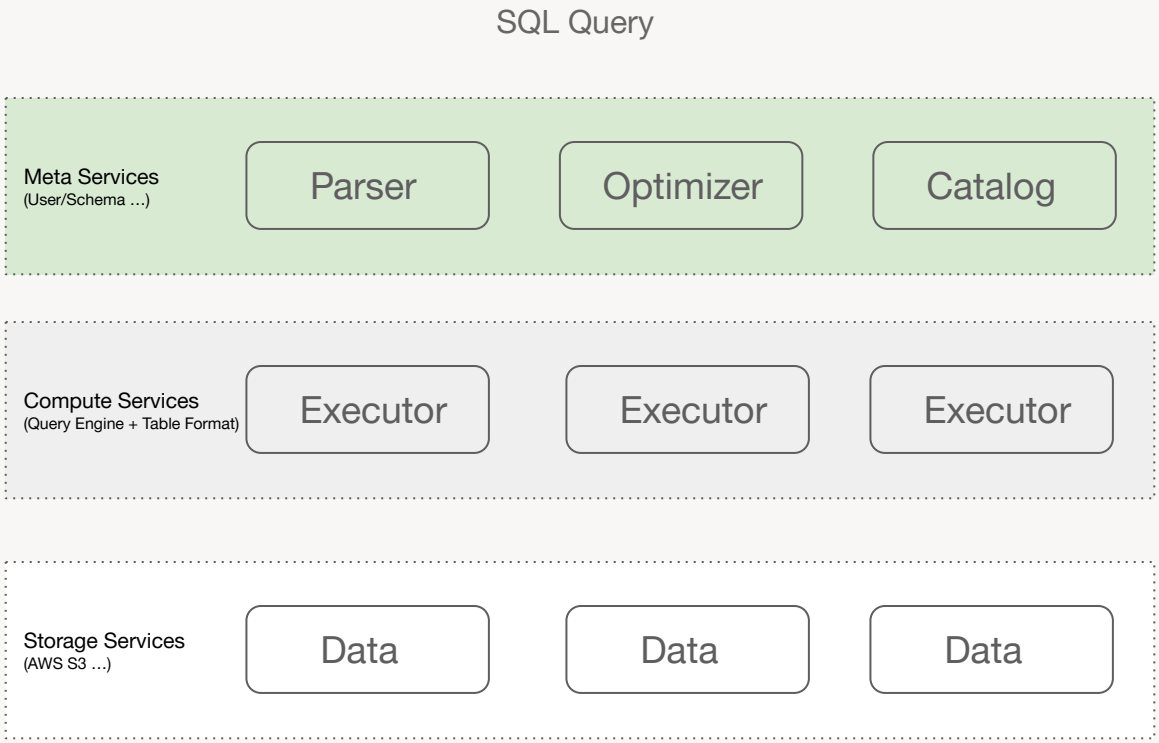
Databend





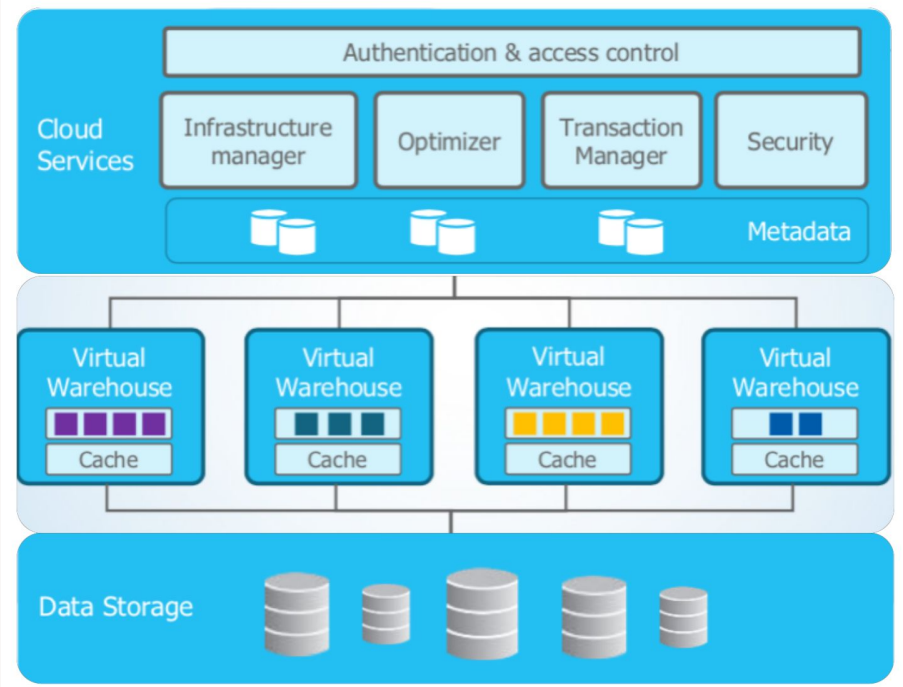
Data Warehouse Microservices

Databend



Snowflake

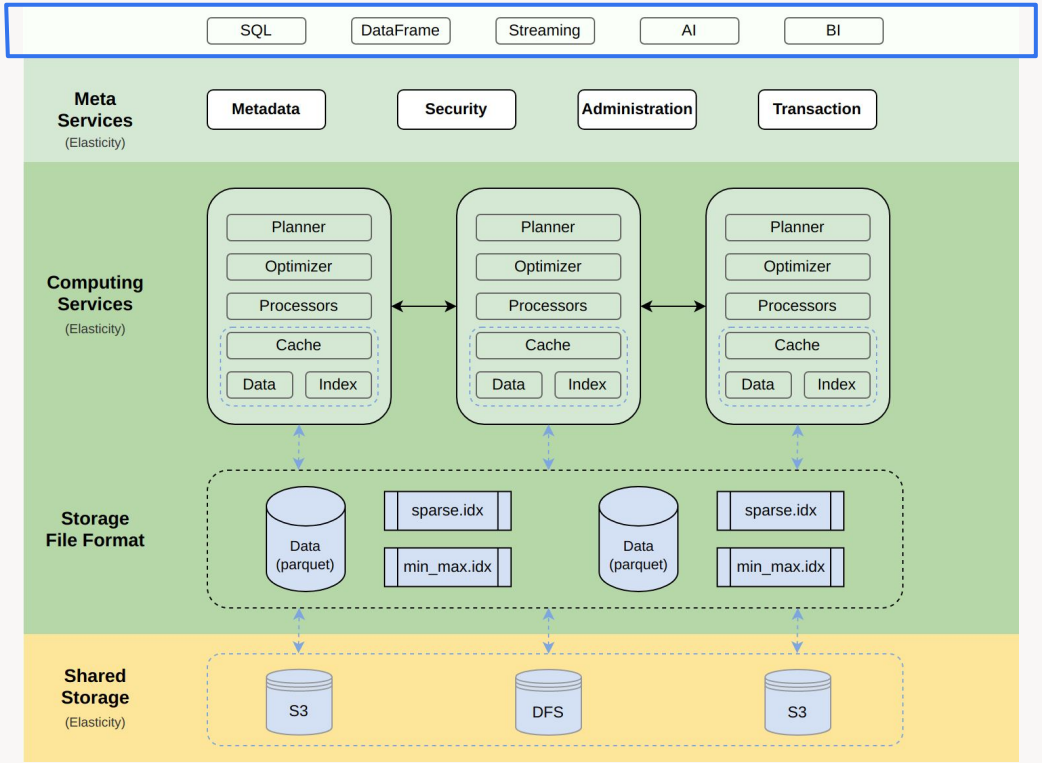
Databend



From snowflake slides

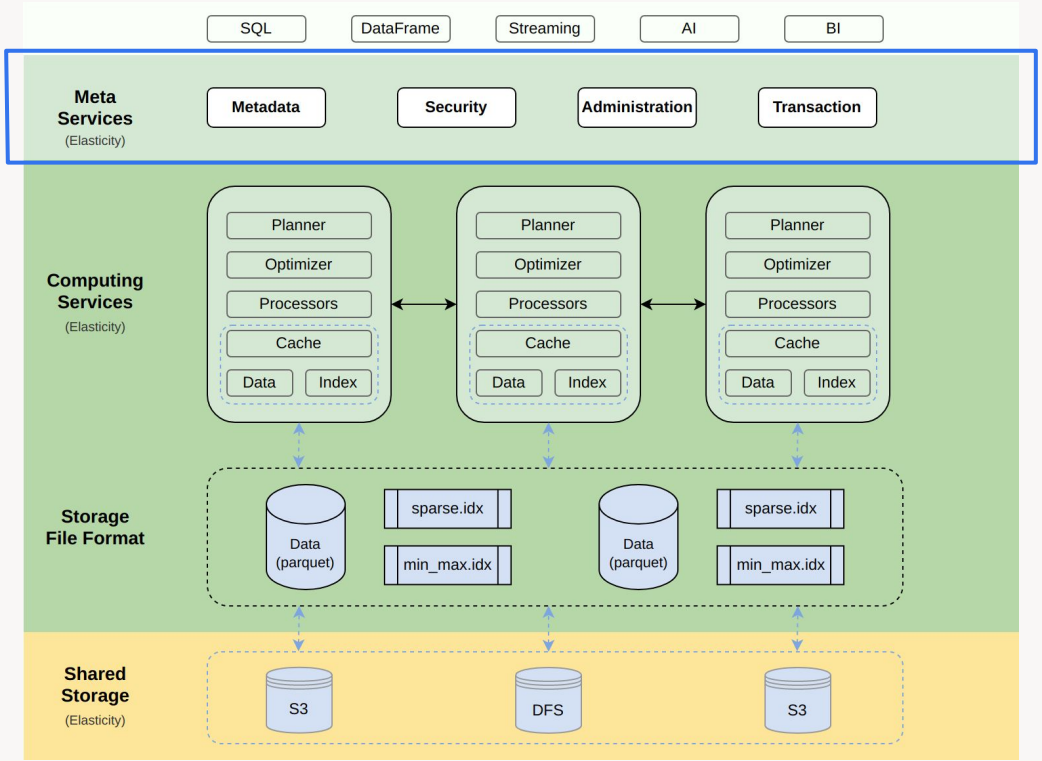
Databend

Databend



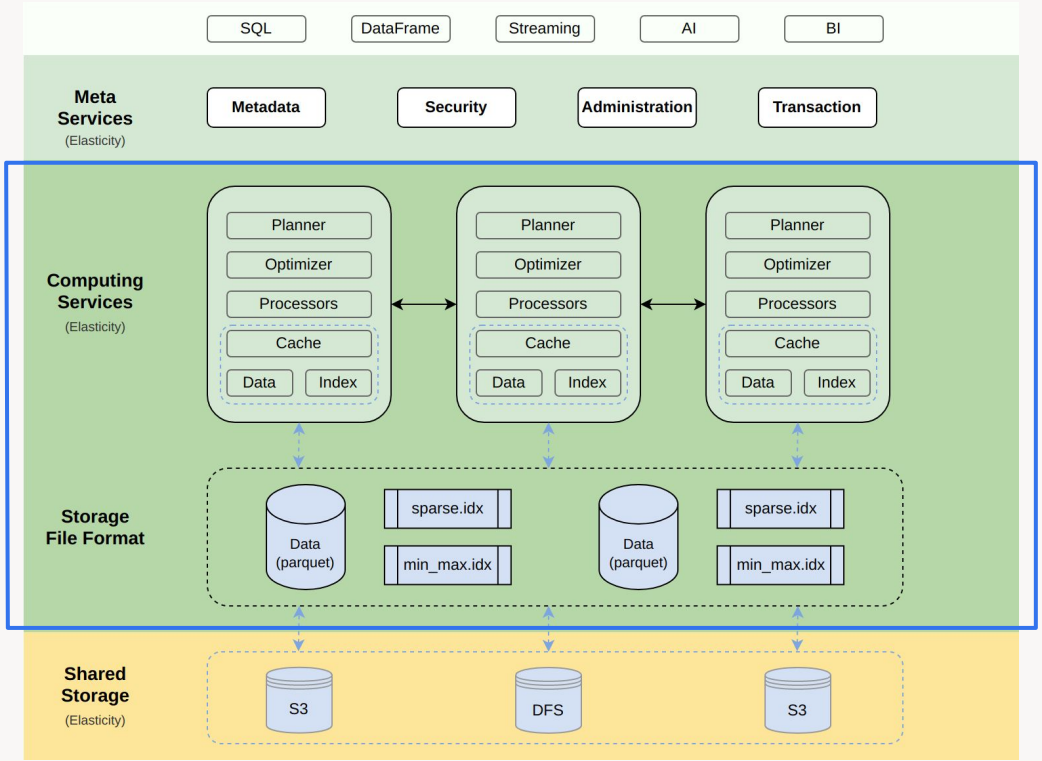
Databend

Databend



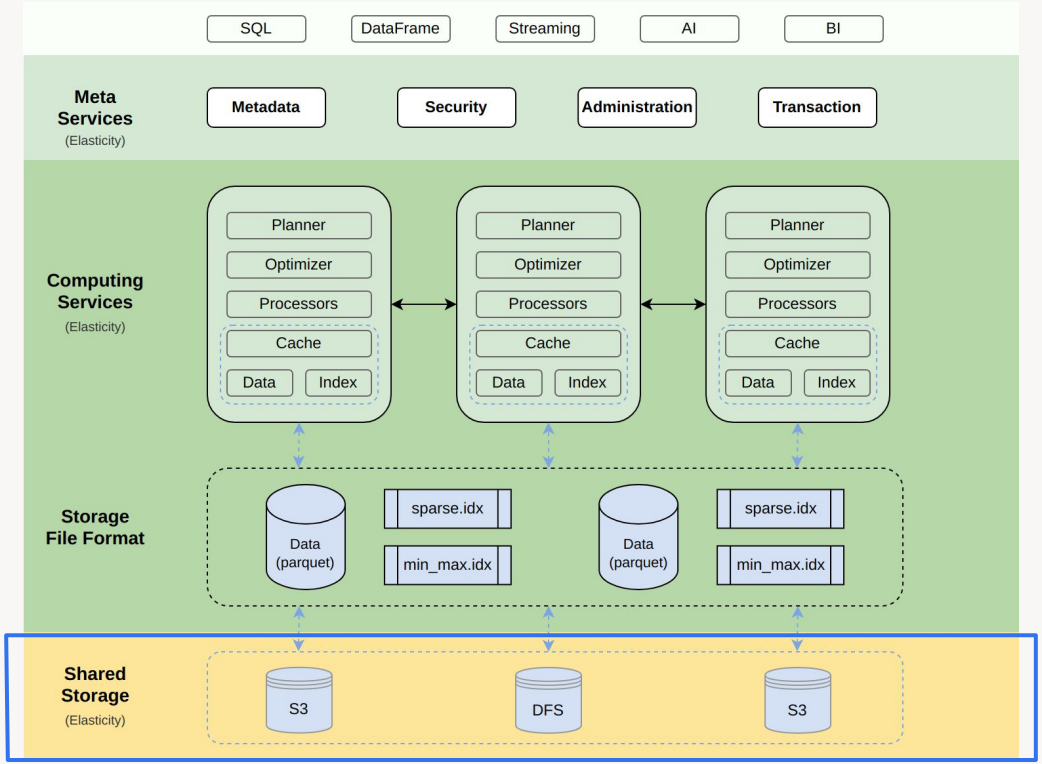
Databend

Databend



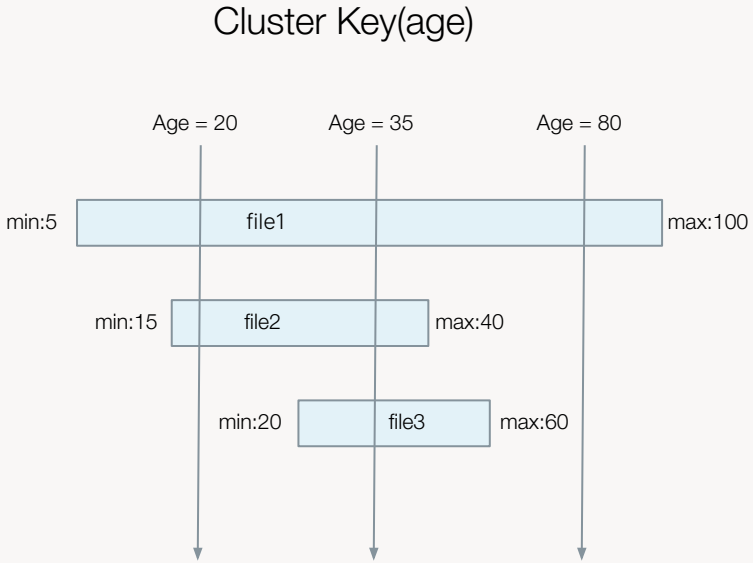
Databend

Databend



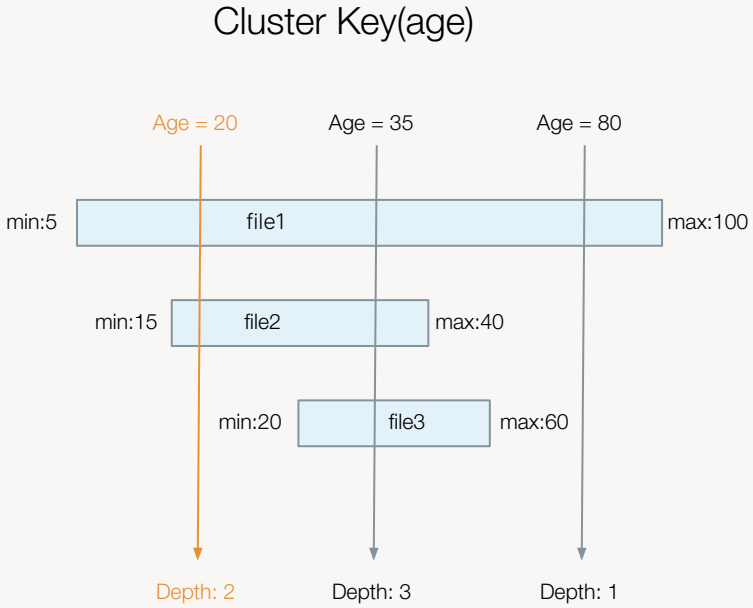
Automatic Tuning Services

Databend



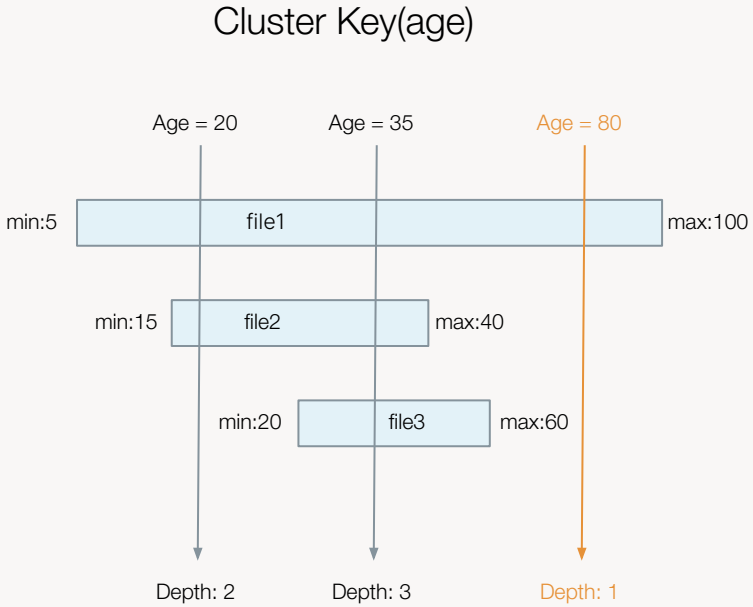
Automatic Tuning Services

Databend



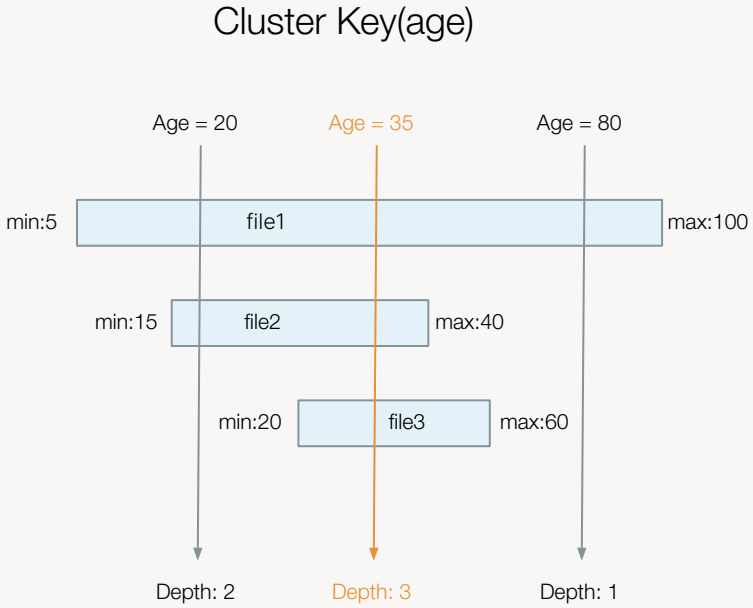
Automatic Tuning Services

Databend



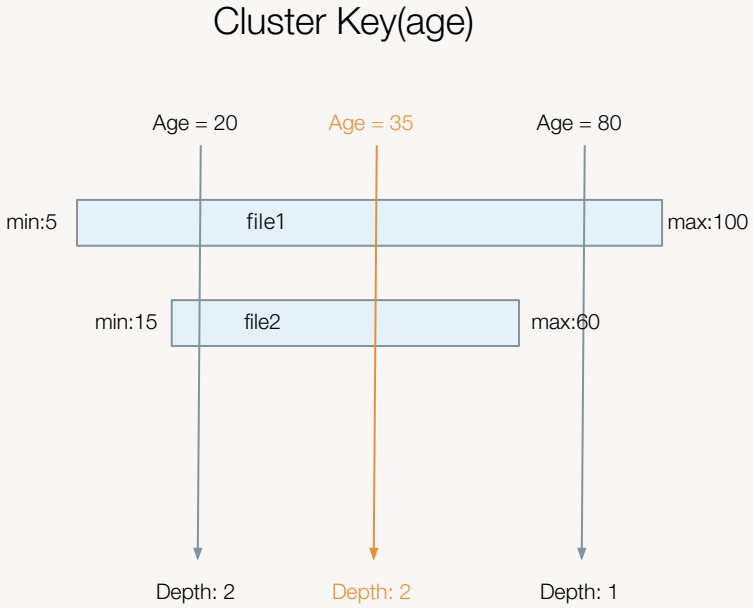
Automatic Tuning Services

Databend



Automatic Tuning Services

Databend



Databend

05

Hello, Cloud Data Warehouse!

Cloud Infrastructure

Databend

- Unlimited computing and storage
- Deploy compute engine on EC2 warm pool
- Store data on AWS S3

  Provides 99.999999999% durability and 99.99% availability

Cloud Data Warehouse

Databend

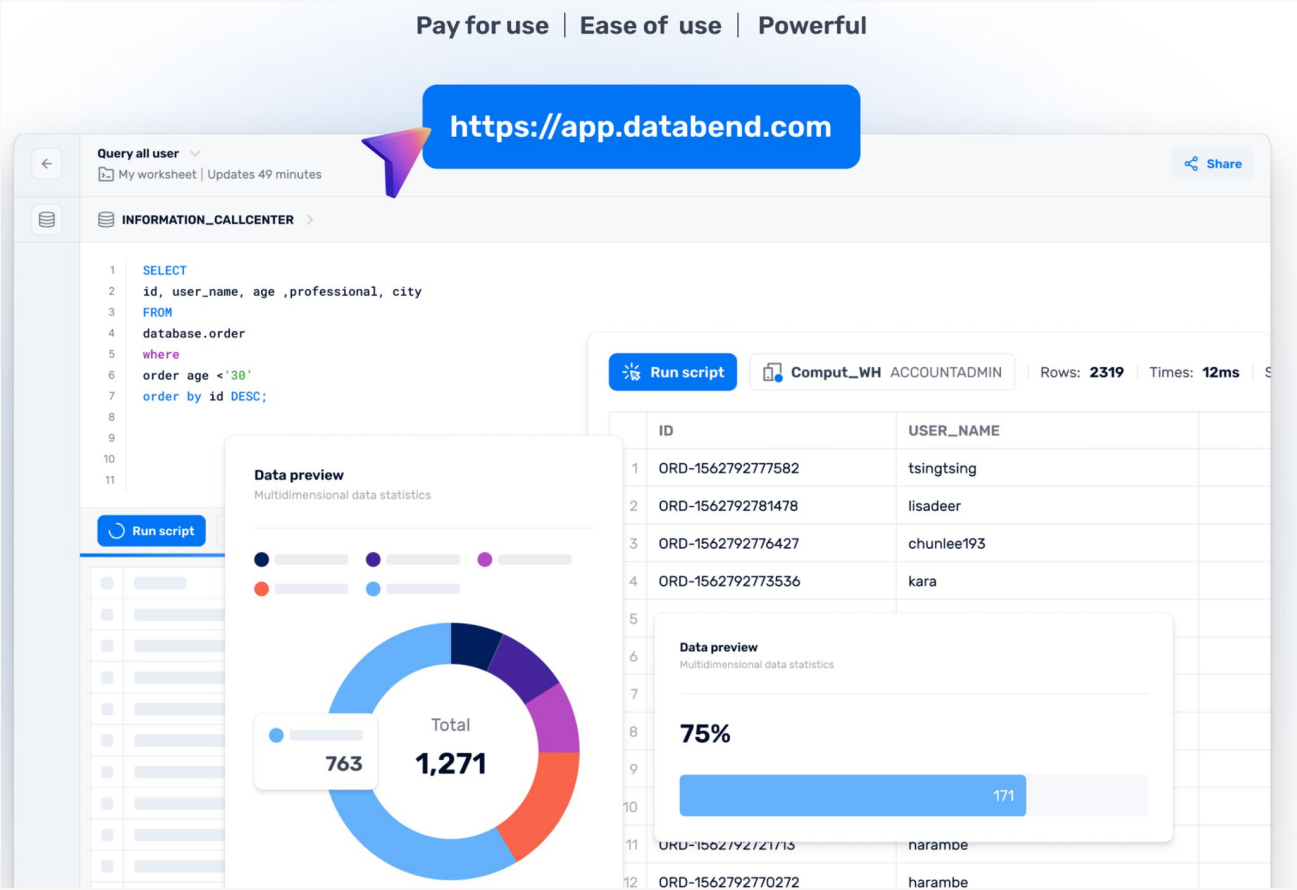
- Database as a service
- Easy to upload and unload data

  copy into table_1 from s3://file

  copy into s3://file from <select * from table_1 where …>
- Support for structured and unstructured data
- Powerful data visualization
- One account for everything
- Data analytics: As simple as using a mobile App
- Designed for everyone

Pay for use | Ease of use | Powerful

Databend



Databend

Thanks