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Inspecting Trino on Ice

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What is Stripe?

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Payments infrastructure for the internet

Millions of companies of all sizes—from startups to Fortune 500s—use Stripe's software and APIs to accept payments, send payouts, and manage their businesses online.

Start now >   Contact sales >

instacart   salesforce

amazon   slack

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Atlas		Billing	
Capital		Checkout	
Climate		Connect	
Corporate Card		Elements	
Identity		Invoicing	
Issuing		Payments	
Payment Links		Payouts	
Radar		Revenue Recognition	
Sigma		Tax	
Terminal		Treasury	
Data Pipeline		Financial Connections	

What is Trino?

- ✓ **Highly parallel and distributed query engine**

- ✓ **Enables interactive data analytics**

- ✓ **Data Lakehouse architecture**

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Trino @ Stripe

Internal use cases

- ✓ **Ad hoc analytics**

- ✓ **Dashboards**

- ✓ **API for internal services and data apps**

- ✓ **No ETL (yet)**

Internal use cases

Trino is the foundational infrastructure on which other apps and services are built upon.

"swiss army knife" in data ecosystem - me, 2023

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Internal use cases

Services

- **Hubble (internal, similar to Superset): ad hoc analytics**
- **Notebooks: data analysis**
- **Streamlit: data visualization**
- **Checker (internal): define and run integrity checks against data**

Internal use cases

Data Apps

- **Inspect Iceberg Tables (go/iceberg/info)**
- **Inspect Table Metadata from Hive Metastore**
- **Inspecting Iceberg usage with Trino queries**

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Inspecting Iceberg Tables (go/iceberg/info)

Problem with Iceberg CLI

- **Requires mydata**
- **Requires bazel build (~30 seconds)**
- **Single command only (`show-metadata` / `show-partitions`)**

😰 `pay exec bazel run //src/scala/com/stripe/iceberg/cli:cli -`

- 🤖 **Machine friendly, not human friendly**

Trino + Iceberg!

Trino Iceberg connector and metadata tables!

Same information!

$history

$snapshots

$manifests

$partitions

$files

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Trino + Iceberg Data App

Templated Queries

```
select * from <table_name>
```

Templated Dashboards

Runs a bunch of templated queries

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Trino + Iceberg Data App

Iceberg Table Information 📌
Shows the current production Iceberg table information (go/iceberg-info)

📢 Leave feedback for @kevinliu   ⚙️

| Schema and Partition Definition | Table Columns | Airflow Runs | Snapshot Info | Files Summary | History | Properties | Find table by s3 location |

schema_name
fact

table_name
costs_raw

Reset   Submit

Iceberg Schema and Partition Definition
Shows schema definition and partition definition

Create Table ⇕

search 1 records...

CREATE TABLE iceberg.fact.costs_raw (

Trino + Iceberg Data App

Iceberg Table Information 📌
Shows the current production Iceberg table information (go/iceberg-info)

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Schema and Partition Definition	Table Columns	**Airflow Runs**	Snapshot Info	Files Summary	History	Properties	Find table by s3 location

schema_name
`fact`

table_name
`costs_raw`

Reset   Submit

Iceberg Airflow Writes
Associates Airflow execution_date to Iceberg snapshot id

'airflow_run (external-id)' ⇕	committed_at ⇕	snapshot_id ⇕	spark_app_id ⇕	operation ⇕
search 8 records...	search 8 records...	search 8 records...	search 8 records...	search 8 records...
20230606	2023-06-07 11:41:38	6584378299722931065	application_1686087130904_0570	overwrite
20230605	2023-06-06 04:33:30	6697669884810570820	application_1685977767581_2025	overwrite

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Trino + Iceberg Data App

Bonus features

- **Analysis! Aggregation, filter, and search**

- **"When did the latest write happen?"**
- **"How much data was in the latest write? In terms of record count, file size."**
- **"How big is my iceberg table?"**
- **"What is the schema and partition spec of my iceberg table?"**
- **"What is the average data file size?" For compaction.**

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Table Properties: The Missing Piece

- **Iceberg stores metadata in the Hive Metastore**
- **"Retention Policy" and other stateful settings**
- ❌ **Not accessible by Trino**

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Inspect Table Metadata from Hive Metastore

Trino + PostgreSQL!

Trino PostgreSQL connector

Read Hive Metastore's database directly with Trino

Trino + PostgreSQL!

Iceberg Table Information 📌

Shows the current production Iceberg table information (go/iceberg-info)

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Schema and Partition Definition	Table Columns	Airflow Runs	Snapshot Info	Files Summary	History	**Properties**	Find table by s3 location

schema_name

table_name

| fact | costs_raw |

Reset   Submit

Iceberg Properties

Properties set in the Hive Metastore. Data is read directly from the Hive Metastore DB

key ⇅	value ⇅
search 16 records...	search 16 records...
write.parquet.compression-codec	zstd
write.location-provider.impl	com.stripe.iceberg.LocalizedLocationProvider

Trino + PostgreSQL!

Bonus features

- **Analysis! 10k foot view of our data warehouse**

- **"How many tables and views are there in our data warehouse?"**
- **"How many are hive tables versus iceberg tables?"**
- **"How many tables contain the `merchant_id` field?"**

Success!

What about Iceberg Table Usage?

"I want to know how this table is used"

"I want to know who's using this table"

"I want to deprecate this table and migrate to this new table"

(RUN_DATASERVING-1628)

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Inspecting Iceberg usage with Trino queries

Trino + PostgreSQL + Trino!

Trino event listener (`QueryCompletedEvent`)

Store events in PostgreSQL DB

Trino PostgreSQL connector to read the events

🐰 🤝 🐰

Query Metadata Enrichment

Modify Trino clients to send extra metadata using
`X-Trino-Client-Info` **in HTTP request**

Example metadata:

- **Dashboard ID**
- **Airflow task name**
- **Checker ID**
- **Workflow engine job name**

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Query Metadata Enrichment

Show up in the source table as `client_info` field

JSON allows arbitrary metadata encoded as dictionary

Access as dictionary using Trino

```
json_extract_scalar(client_info, '$.host')
```

Query Metadata Enrichment

Bonus features

- **Analysis! Enables multitude of auditing, debugging, and optimization use cases**

- **"Who is still using this table? I need to deprecate it!"**
- **"What are the most queried tables?"**
- **"What are the most queried columns for this table?"**
- **"What is the top service using Trino? What is the usage pattern?"**
- **"What are the most common errors in the last hour?"**

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Future Work!

Trino as validation framework

Trino for Iceberg table maintenance (compaction, manifest rewrite)

Table optimizer based on read patterns

Hive Metastore Attribution

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Q & A

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Thank you!

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