Real-Time Deep-Link Analytics for Big Graphs

Challenges and Solutions

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TigerGraph

BigGraph Meetup
October 11, 2017

Welcome to BigGraph Meetup

We meet to network, share, discuss, and invent together graph technologies that empower the analysis capabilities needed for today's most critical enterprise applications.

Goal: real-time and mutable Big Graph data management platform supporting deep link analytics

- Big Graph? Billion-scale Graphs, with 10B to 100B+ vertices and/or edges.
- Real-time milli-second query response time on Big Graphs.
- Mutable data mgmt supporting real-life scenarios, > 100K+ updates per second.
- Deep link analytics queries which traverse 3 to 10+ hops deep into the graph.

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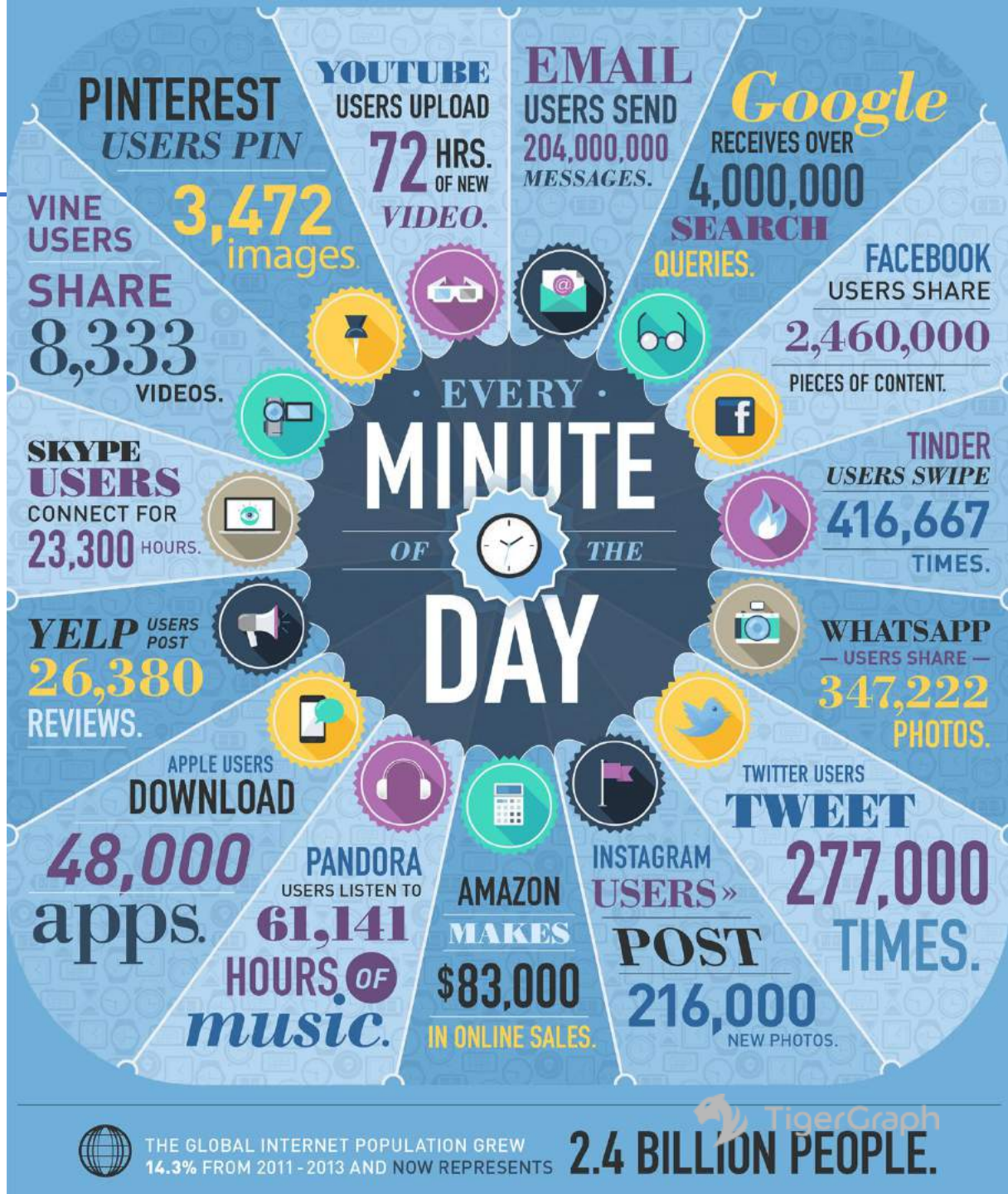
The Data Deluge

Data Never Sleeps 2.0

from Domo.com

https://www.domo.com/learn/data-never-sleeps-2



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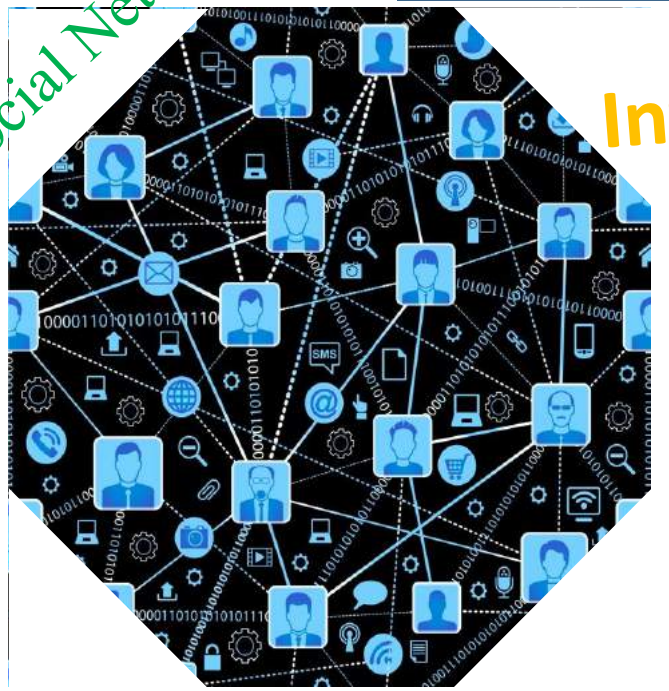
The Networked Age

Social Networks



Internet of Things

BIG DATA

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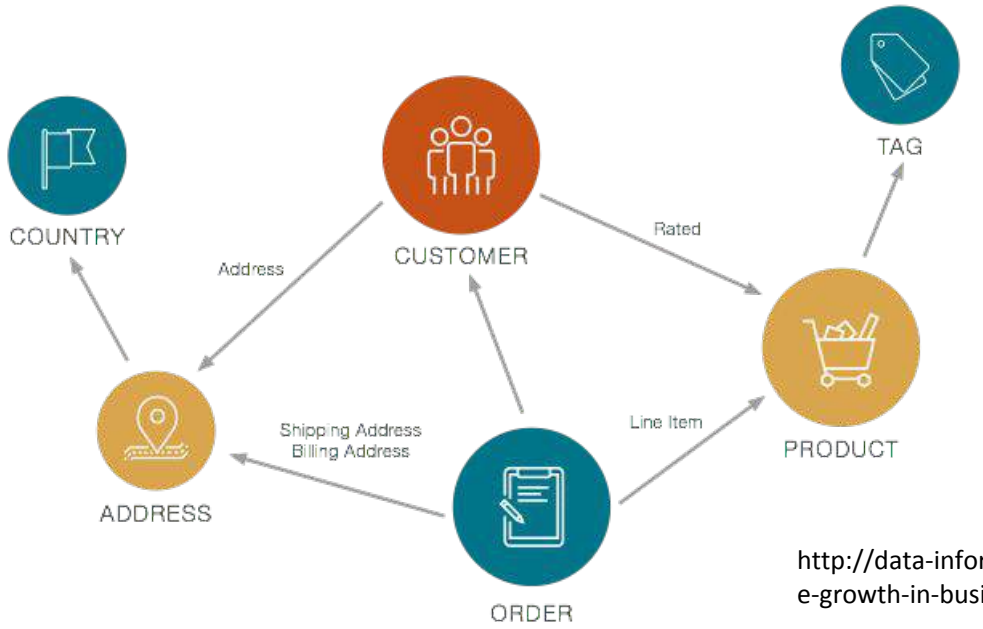
Graph Data Analytics to the Rescue

- Natural storage model for connectional data
- Natural model for many types of transactions
- Natural computational model for knowledge/inference/learning – chaining and combining observations



http://data-informed.com/graph-databases-see-growth-in-business-applications-adoption/

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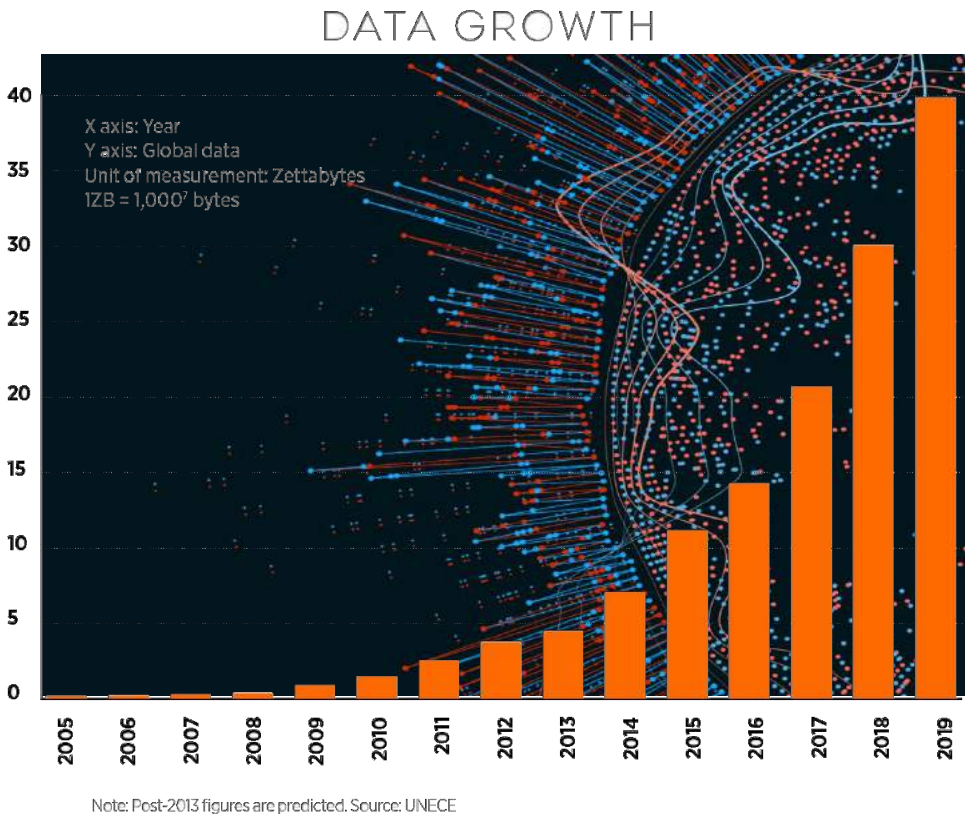
Challenge: Scalability

- Datasets are getting bigger
- Outgrowing a single server in many cases.
- More data → better models/predictions/results
- **Problem**: Some graph DBs cannot distribute across multiple nodes.

Requirement:
Data Platform must scale-up and scale-out well



https://www.theneweconomy.com/strategy/big-data-is-not-without-its-problems

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Challenge: Real-Time Processing

Many applications require real-time processing.
Gets harder as data sizes get bigger.

- Processing transactions
- Engaging customers
- Catching fraud in progress
- Managing live systems
- Ingesting streaming data

Requirement:
Speed needed both for querying and data updates/loading

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Challenge: Deep Link Analytics

- Each additional hop in a graph reveals more information / knowledge / evidence
- Deeper traversal → better models/predictions/results
- **Problem**: Most graph DBs slow down or timeout after 2 hops.

Requirement:
Data Platform must traverse multiple hops efficiently

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Need: Scalable Real-Time Deep Link Analytics

Deep Link Analytics: Queries With 3 Or More Hops

Deep Link Analytics are essential for enterprise applications including AI and machine learning apps

fraud and risk management, anti-money laundering

personalized recommendation, knowledge graph, customer identity graph, supply-chain logistics, …

Requires a real-time graph platform that shatters current graph database speed and performance limitations

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Solution: Native Parallel Graph

TigerGraph: The First Native Parallel Graph

Designed From the Ground Up For Computational Parallelism

NATIVE

graph storage

PARALLEL GRAPH

computation engine

10X+

compression

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Native Parallel Graph

Automatic Computational Parallelism

Each vertex/edge is not only a unit of storage, but is also a computational unit

Each vertex/edge is processed in parallel

TigerGraph engine will automatically scale the computation across all threads and CPU cores available

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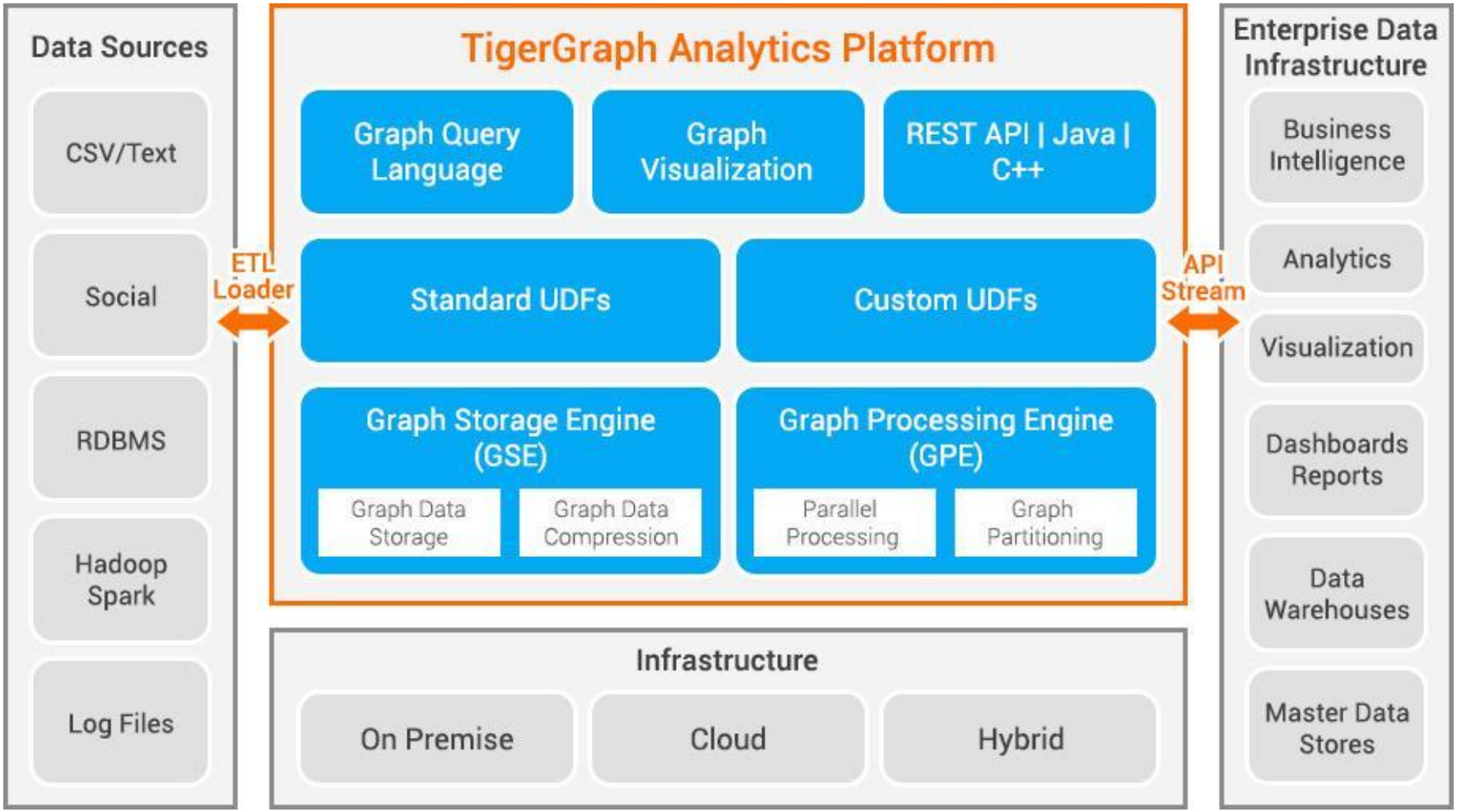
Real-Time Graph Analytics Platform



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Demo: Queries Per Second on a Big Graph

- Graph Schema and Size: Delivery service
  - 7 vertex types: Order, User, Location, CreditCard, etc.
  - 9 edge types: Order_User, Order_Location, Order_Card, etc.
  - 3.4 Billion vertices
  - 22.5 Billion edges

- Test Server
  - Amazon EC2 i3.16xlarge
  - 64 vCPU, 488 GiB Memory, 15 TB SSD Storage

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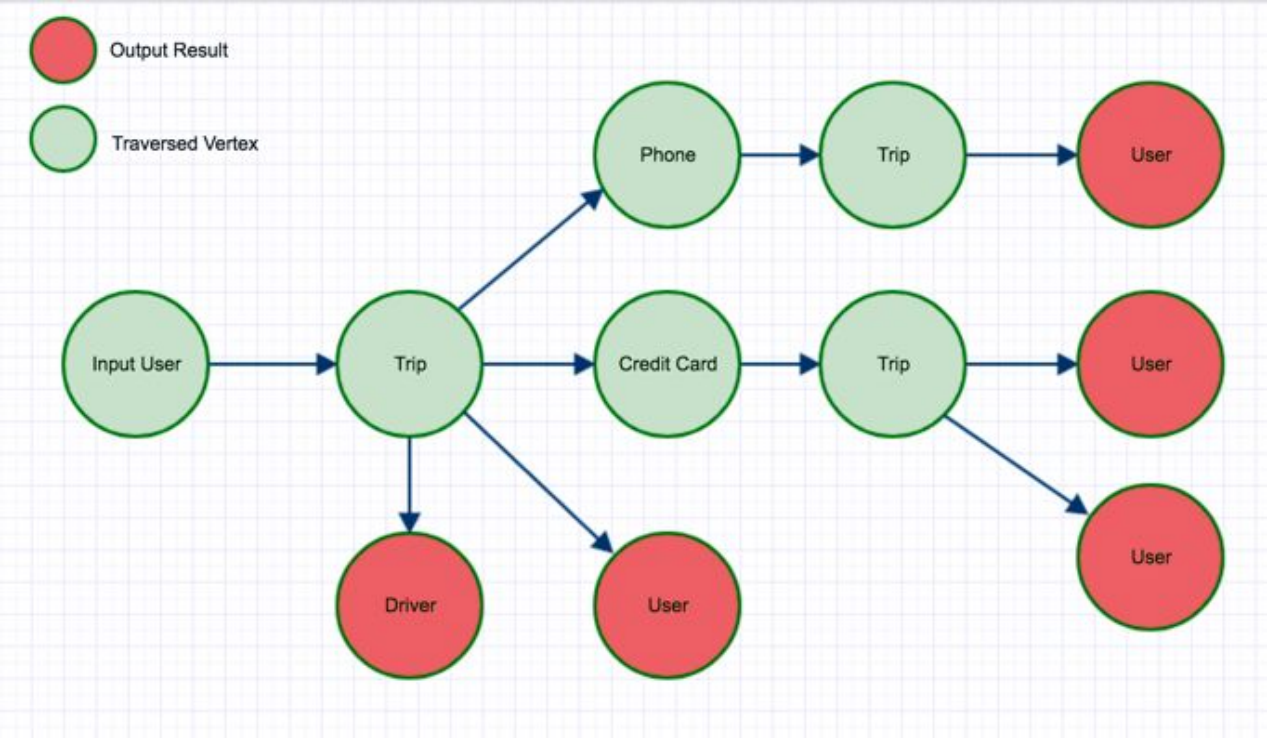
Demo: Queries Per Second on a Big Graph

Starting with a Driver_id X, find all other Driver_ids/User_ids connected to the Driver_id X through phone_number, credit_card connected via trips in 4 steps



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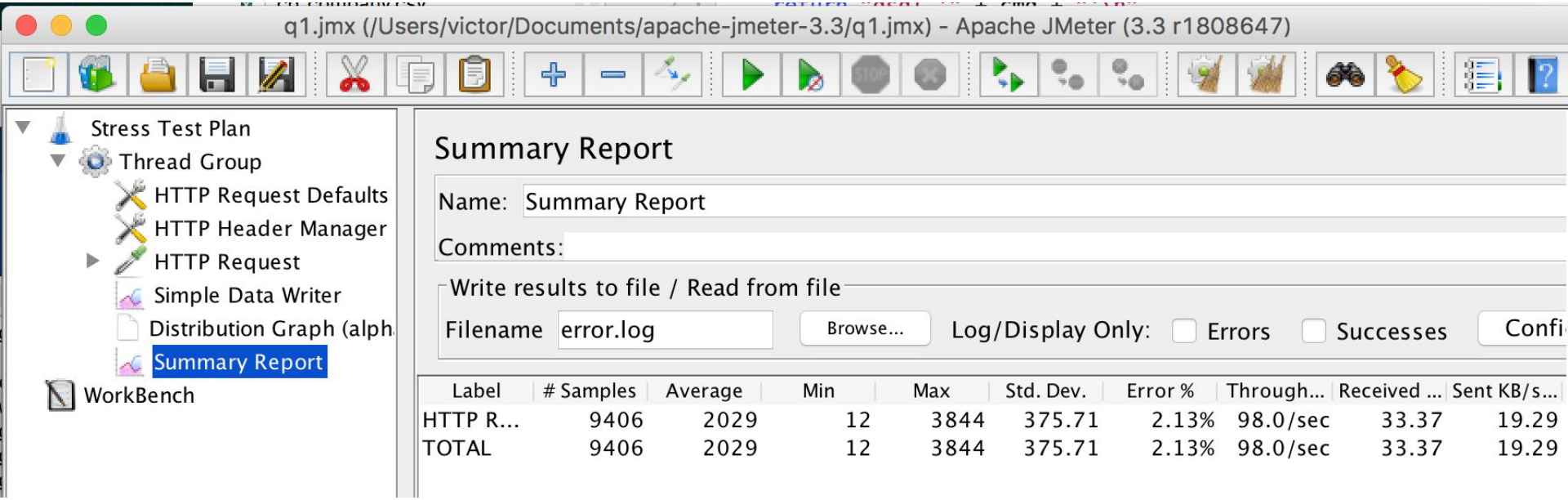
Demo: Queries Per Second on a Big Graph

Based on the graph density, each query can traverse about 100K edges.
The live test shows that we can process 98.0 queries per second per machine
→ 10M edges per second, for a 4-hop query on a graph with 22B edges.

Even better speed is possible for a less demanding test.



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A Closer Look At the TigerGraph System

web browser based tool to visually and interactively define, create, explore and query big graphs

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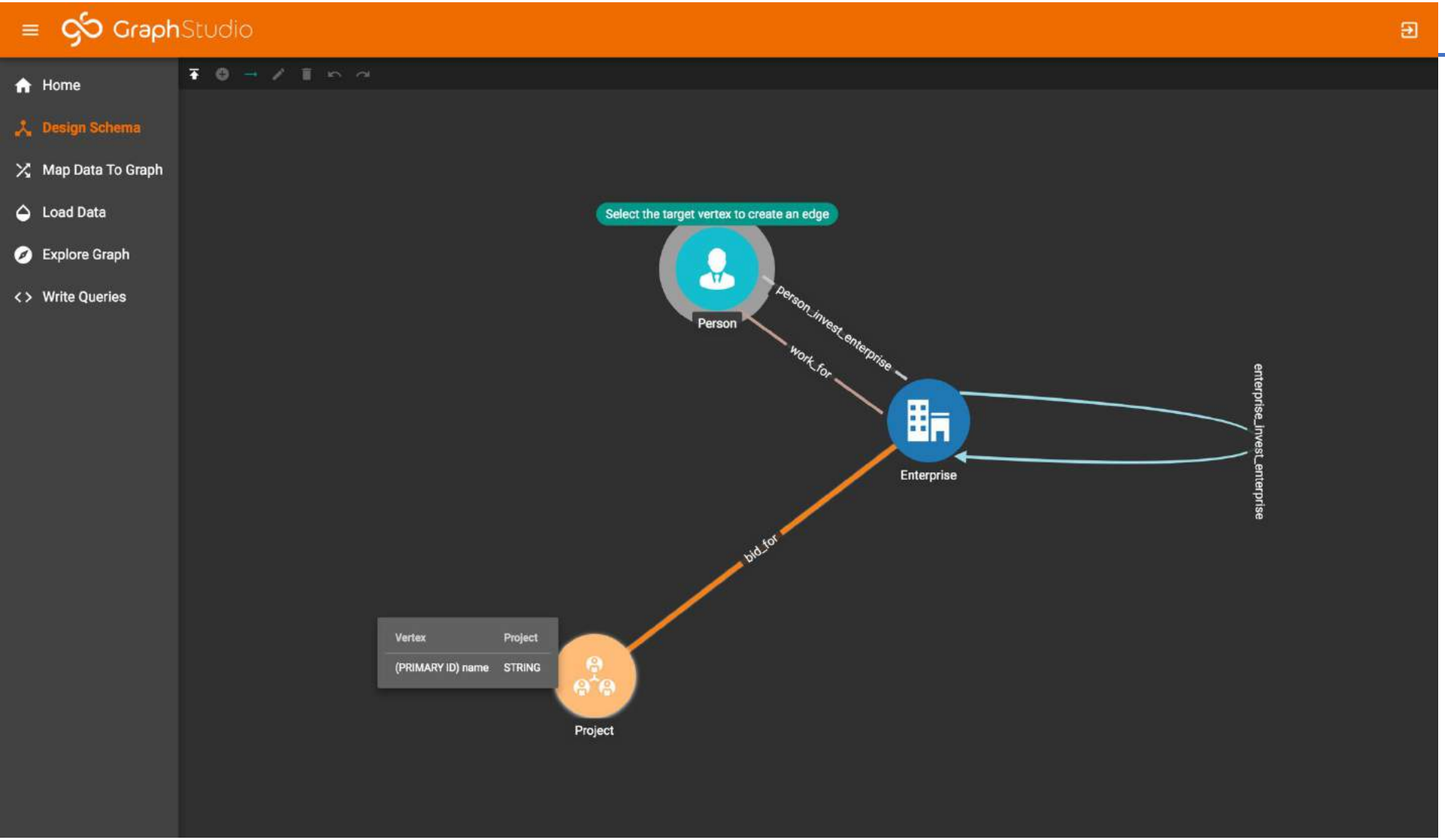
GraphStudio: Visual Graph Schema Designer



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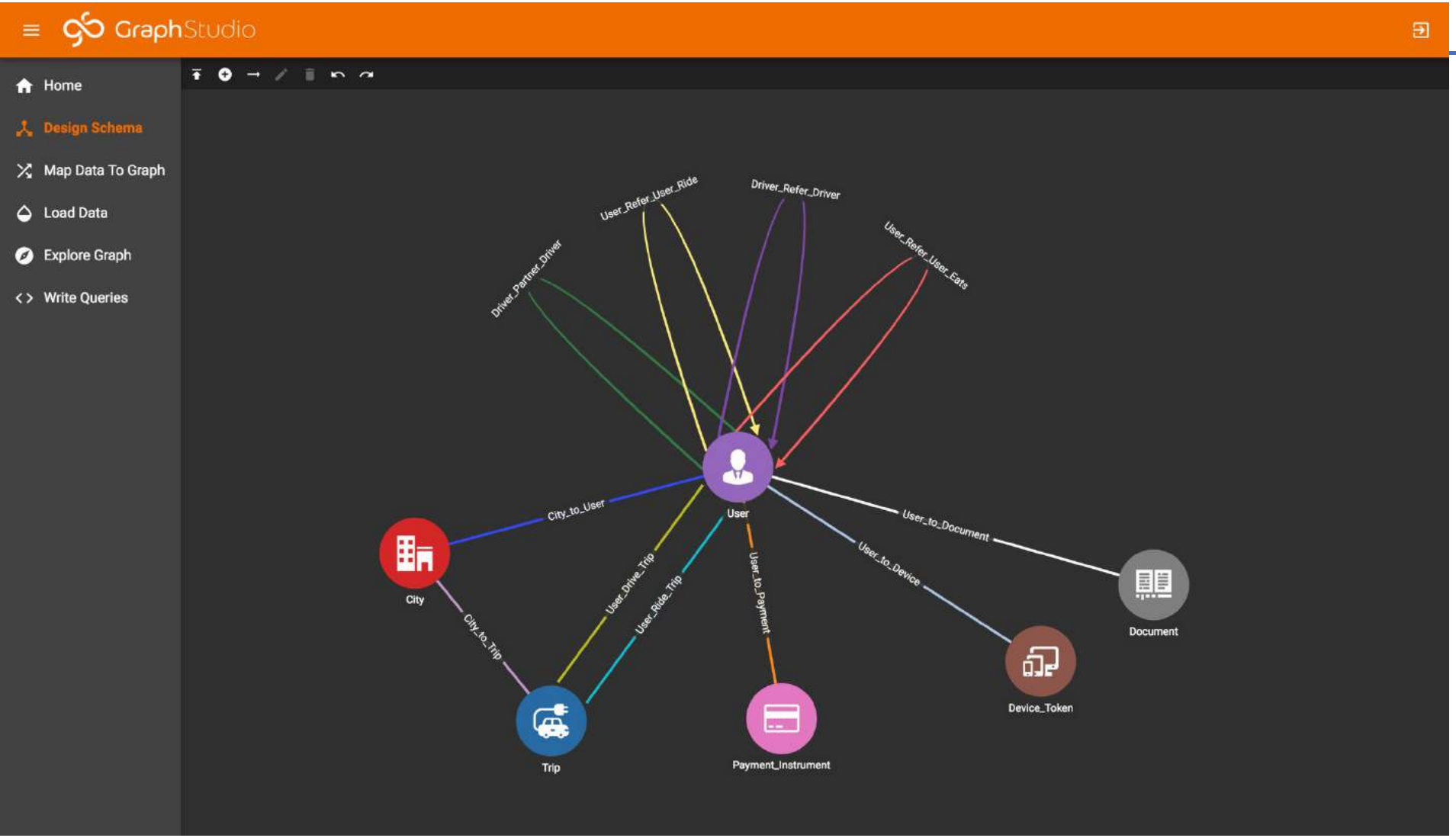
GraphStudio: Visual Graph Schema Designer



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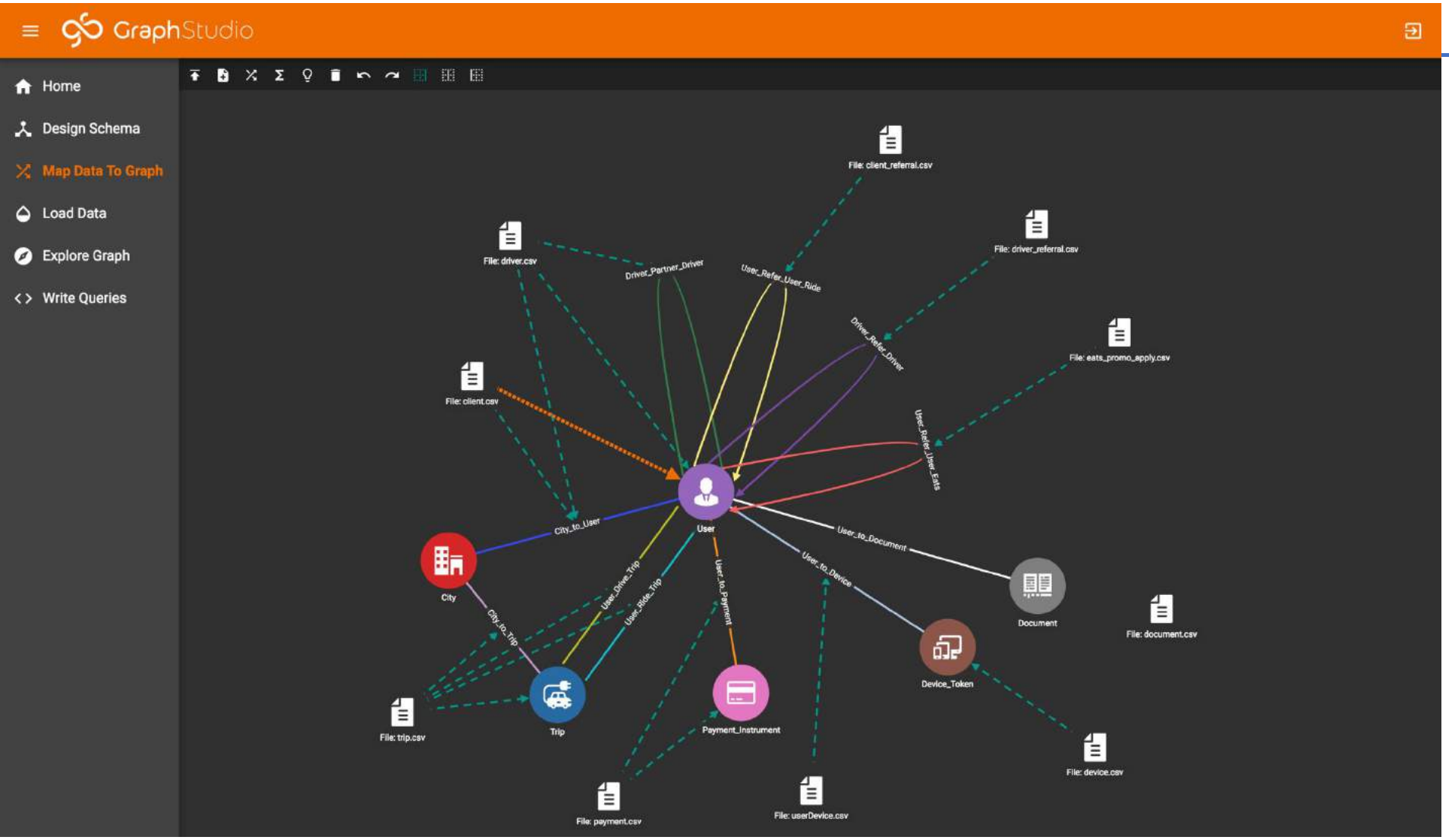
GraphStudio: Visual Graph Data Loader



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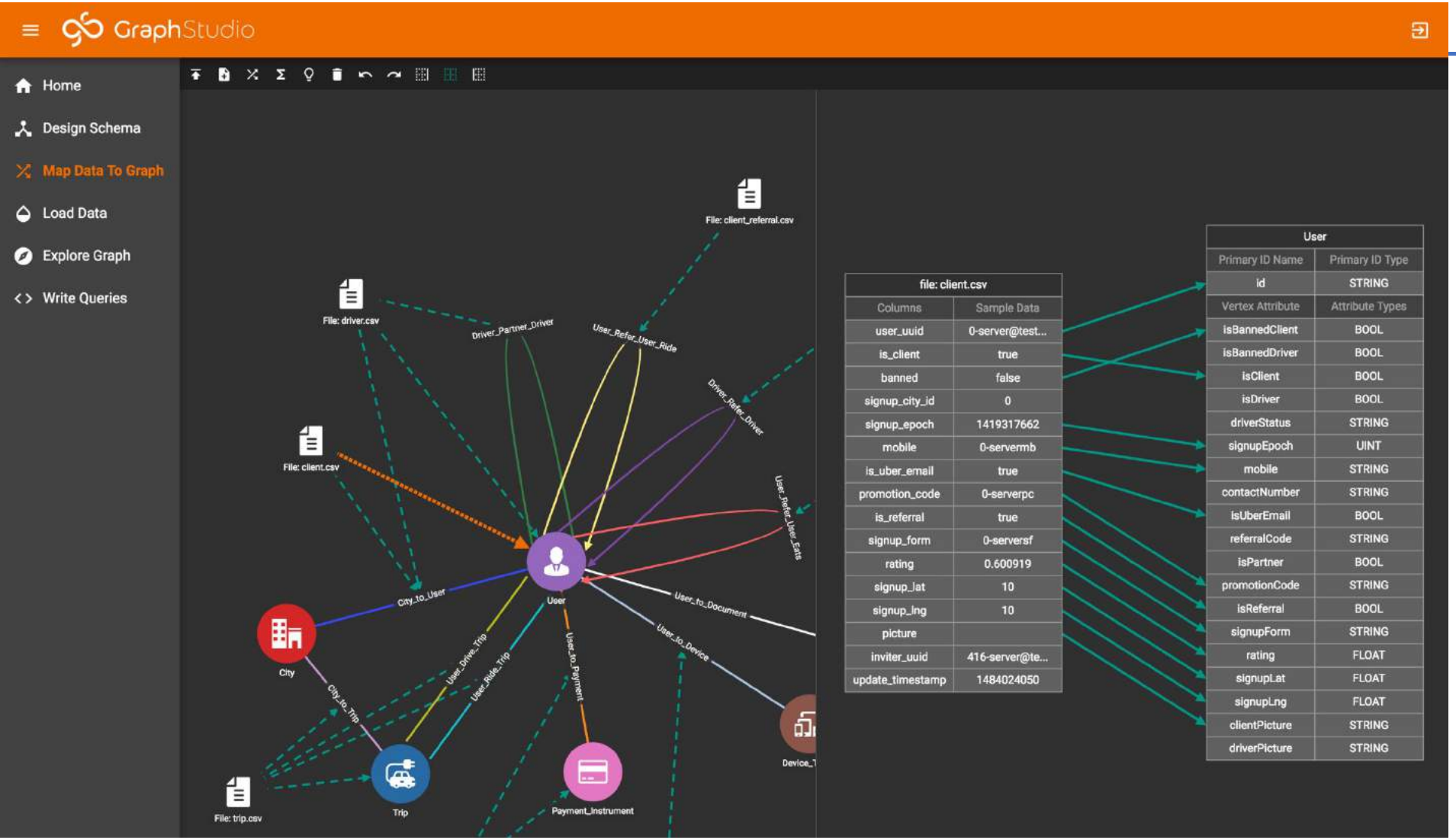

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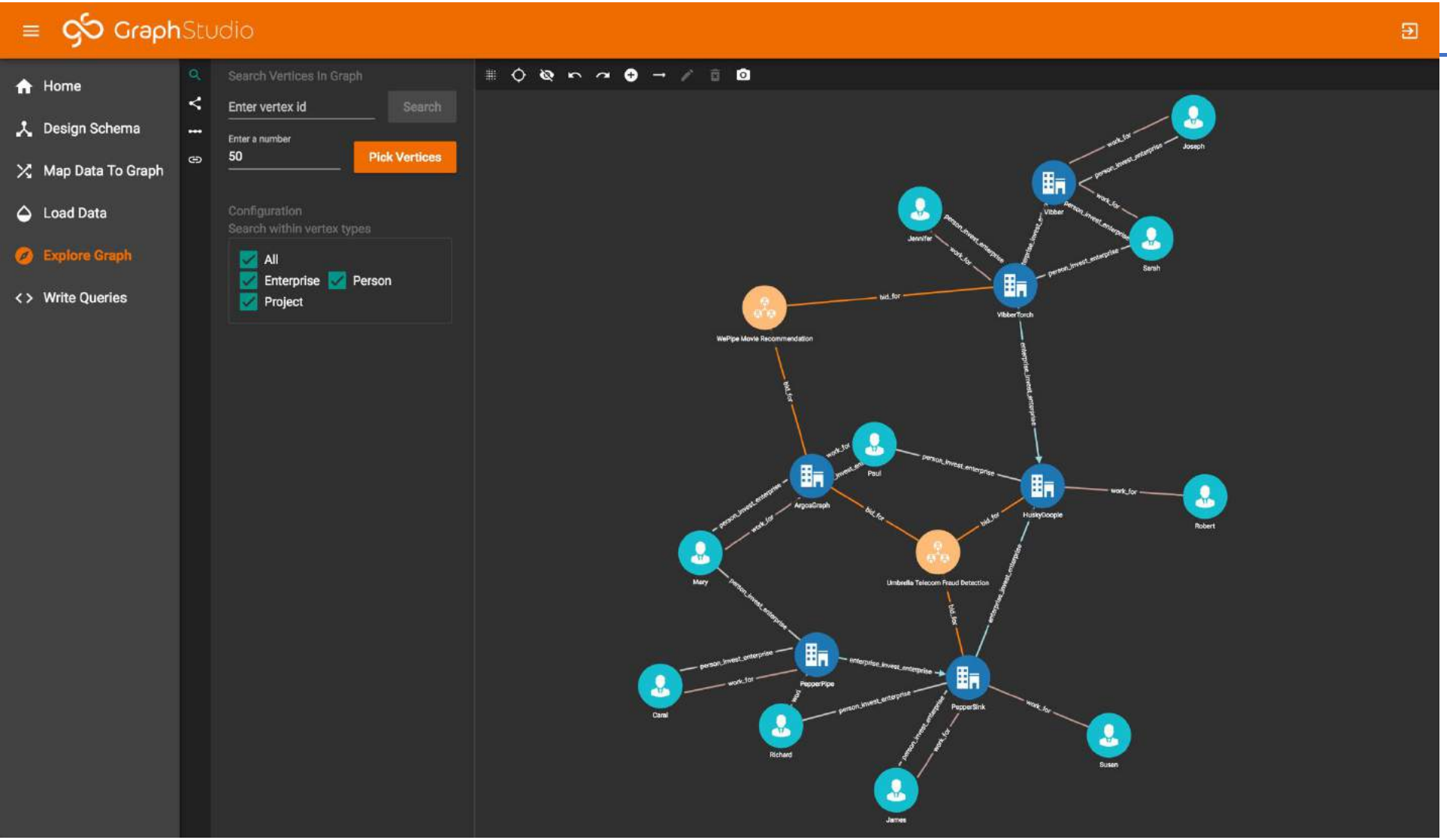
GraphStudio: Graph Explorer



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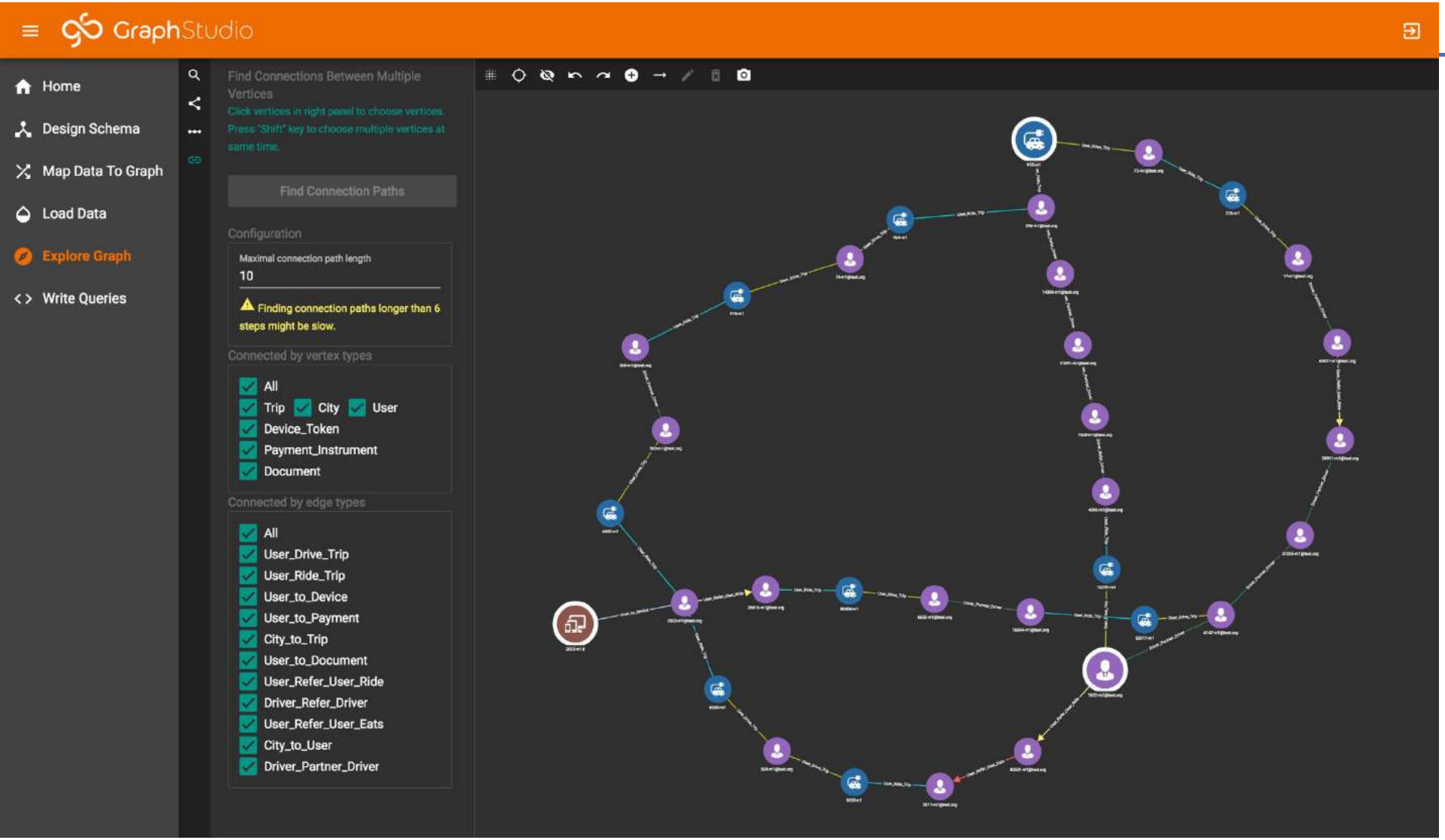
GraphStudio: Graph Explorer



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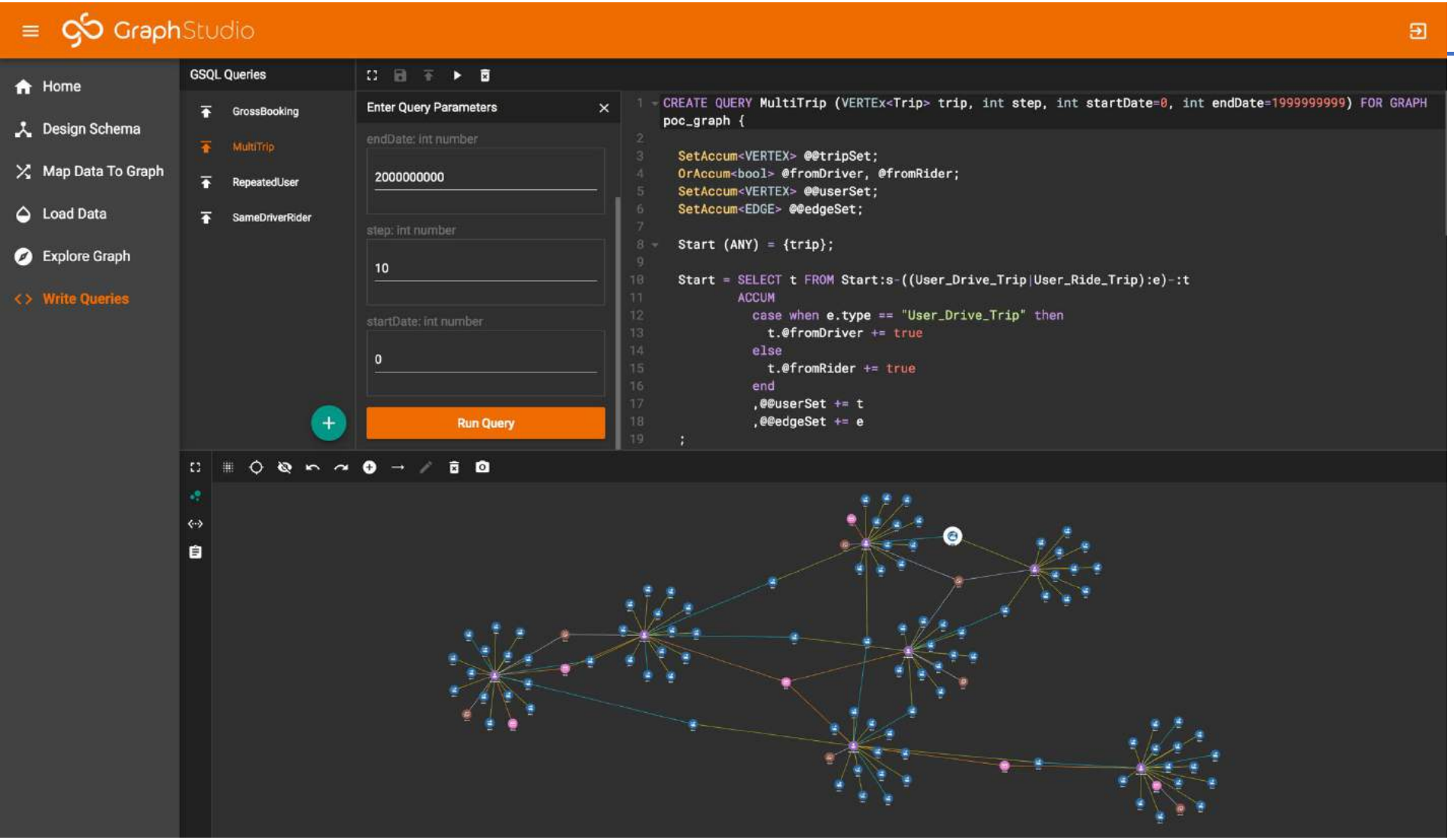
GraphStudio: Graph Query Editor



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TigerGraph is Hiring!

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- Senior Technical Product Manager

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More questions?

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