datasciencedojo
data science for everyone

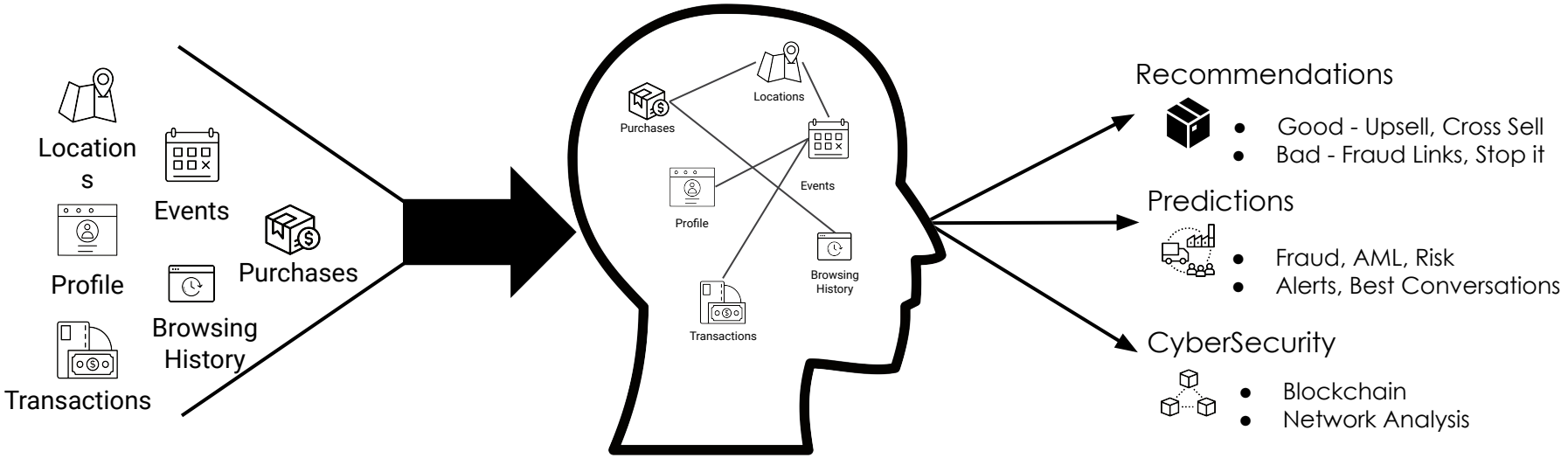
Introduction to Graph Analytics

Advanced Analytics & ML for Connected Data

24 may
ticket?
about whom?
why five?
#4

Graph Is How WE THINK

Graph is a natural model for interconnected data.
It is an organic way of modeling data for a variety of relationships and transactions.



Identify key data and process massive amounts of data

Use the power of relationships and deep analytics to provide insights

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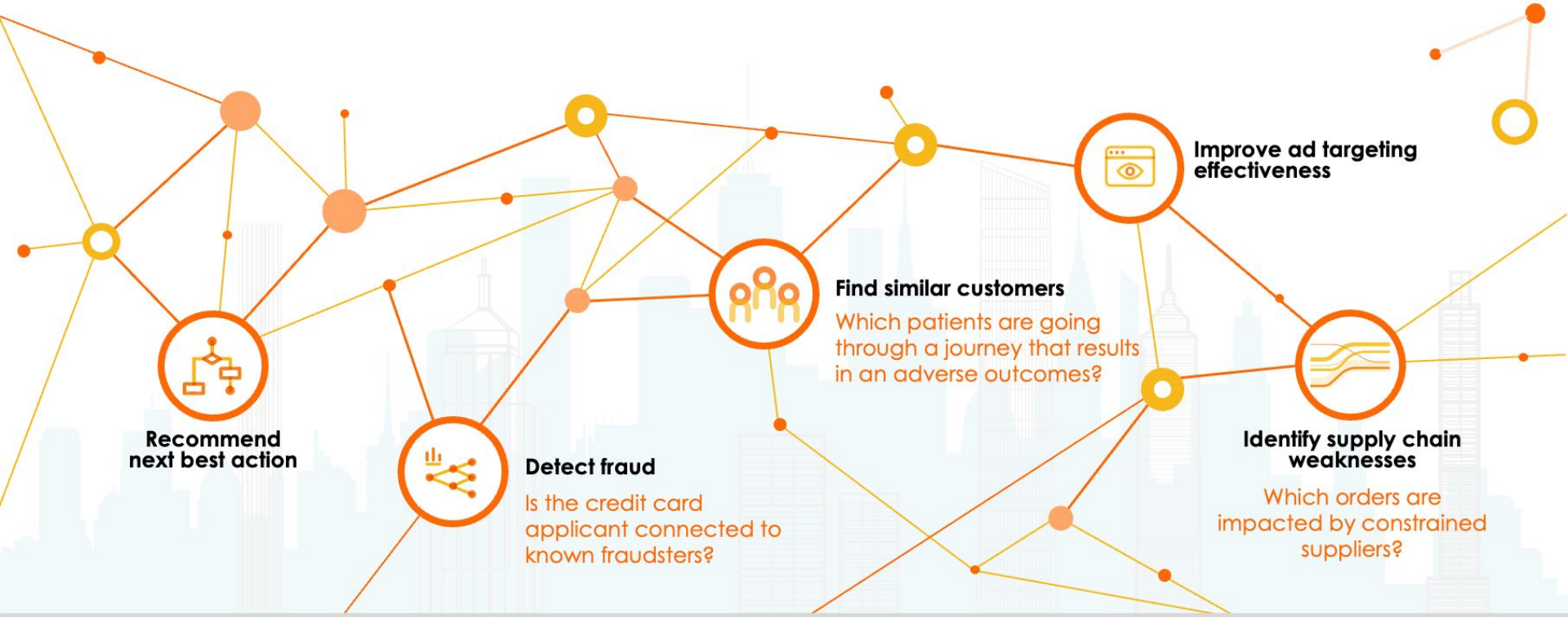
Modern businesses need intelligent answers to complex questions…



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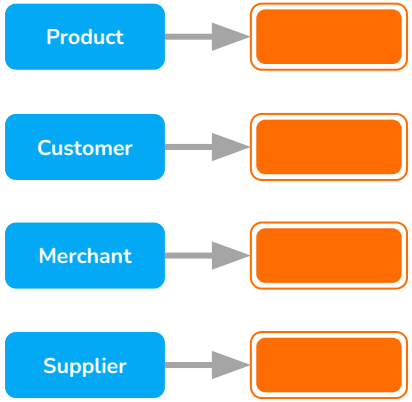
Graph Stores Data Differently

Key value

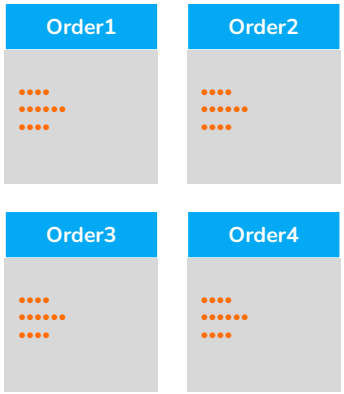
High speed storage / retrieval apps



Shopping carts, real-time bidding, messaging, and chat

Document

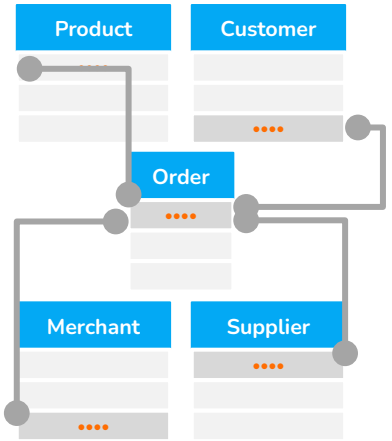
Front-end apps with unstructured data



Gaming, content management, mobile apps, and IoT

Relational

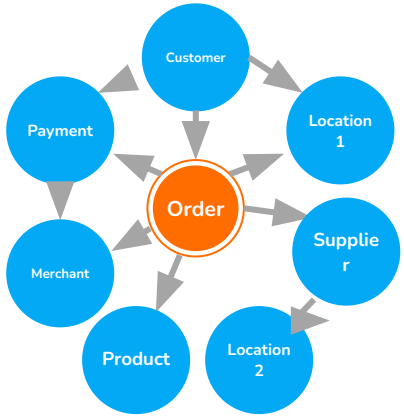
Transactional systems of record with structured data



Customer billing, payroll, inventory monitoring, and bank accounts

Graph

AI / ML powered apps and wider, deeper analytics



Fraud detection, compliance, supply chain, customer 360, predictive maintenance, IoT Analysis, and EMS

Queries

Simple — Complex

TigerGraph © 2022. ALL RIGHTS RESERVED. | TIGERGRAPH.COM

Relational databases don’t tell the whole story

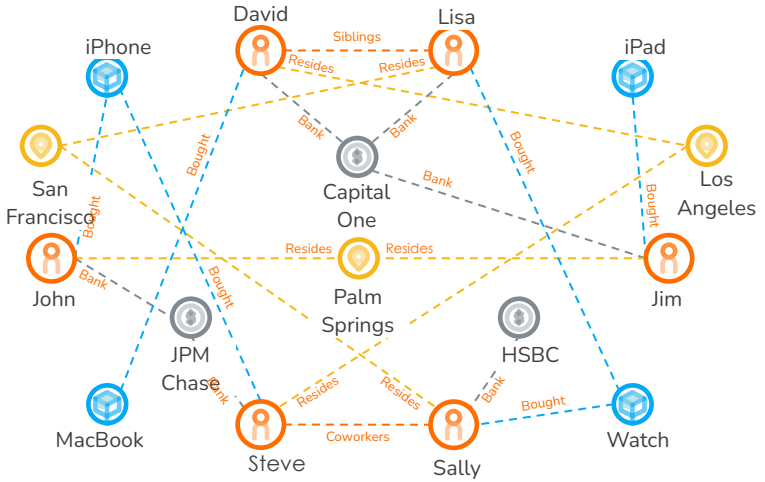
Relational databases store facts in tables

Name	Location	Product	Bank	•
John	Palm Springs	iPhone	JPM Chase	•
David	Los Angeles	MacBook	Capital One	•
Lisa	San Francisco	Watch	JPM Chase	•
Jim	Palm Springs	iPad	Capital One	•
Sally	San Francisco	Watch	HSBC	•
Steve	Los Angeles	iPhone	JPM Chase	•

- Cannot easily model indirect relationships
- Cannot run queries across data sets without slow joins
- Cannot add new relationships without schema changes

Surface level sampling

Graph databases view the world as it is



- Flips the perspective from facts to relationships
- Scales massively without sampling
- Faster queries at greater depth

Rich, intuitive analysis

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Graph databases make AI/ML models faster and more accurate

Richer, smarter data

- Relationships-as-data
- Connect different datasets, break down silos

Deeper, complex questions

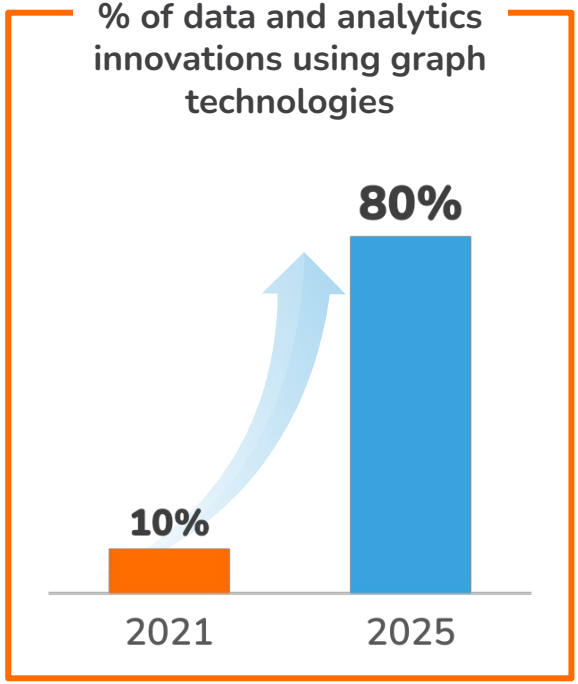
- Look for semantic patterns (implicit relationships)
- Easily and quickly search far and wide

Accelerated performance

- High-speed queries
- Relationship powered algorithms and machine learning

Explainable results

- Intuitive models, queries and answers
- Visual exploration and results



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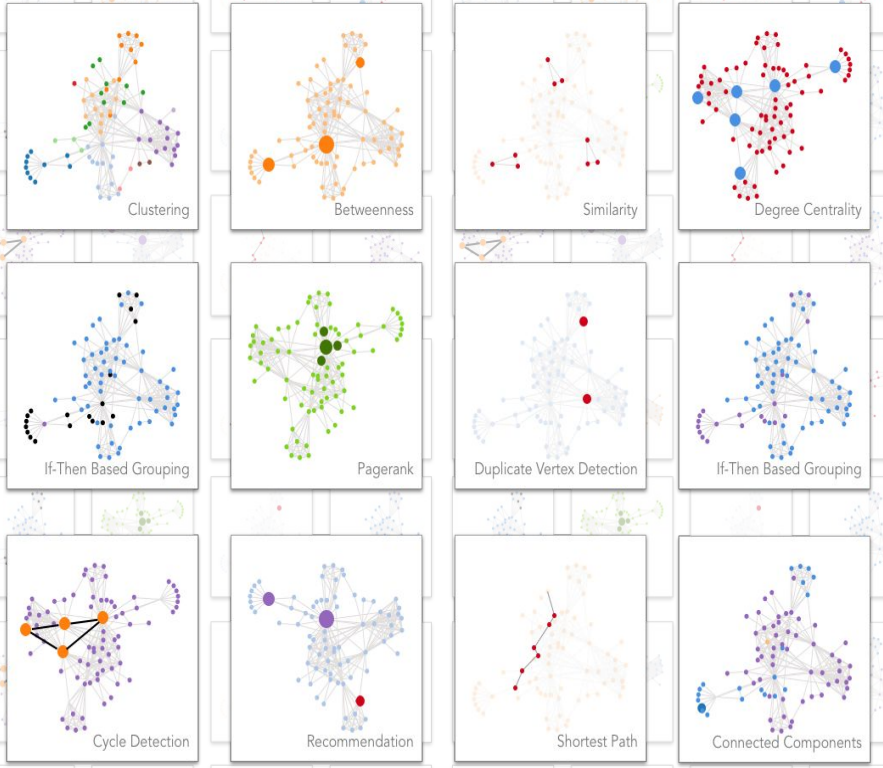
Machine Learning and Algorithm Support

(70+ Github)

GRAPH

- Clustering
- Betweenness
- Similarity
- Degree
- Page Rank
- Recommend
- Shortest Path
- Connected
- Centrality
- Detection



ML

- Graph Convolutional Networks (GCN)
- Temporal Pattern Detect
- Louvain
- Dependency Networks (RPN)
- Markov Networks (RDN)
- Probabilistic Models (PRM)

Algorithm Types

- **Centrality**
  Assign numbers or rankings to each vertex corresponding to their network position
- **Classification**
  Classify the vertices into sets according to some external rule
- **Community**
  Group the vertices so that each group is densely connected
- **GraphML/Embeddings**
  Convert the neighborhood topology of each vertex into a fixed size vector of decimal values
- **Path**
  Find the best paths from one vertex to another (shortest, lowest weight, or other criteria)
- **Similarity**
  Compute similarity between pairs of items
- **Topological Link Prediction**
  Predict the existence of a link between two entities in a network
- **Frequent Pattern Mining**
  Find subgraph patterns that occur the most frequently

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Common Use Cases

Uses cases to apply graph include:

- Entity Resolution
- Customer Journey / C360
- Recommendation Engines
- Supply Chain
- Fraud/AML
- Data Fabric
- Cybersecurity
- AI & Machine Learning

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Q&A Break

Focus on Fraud

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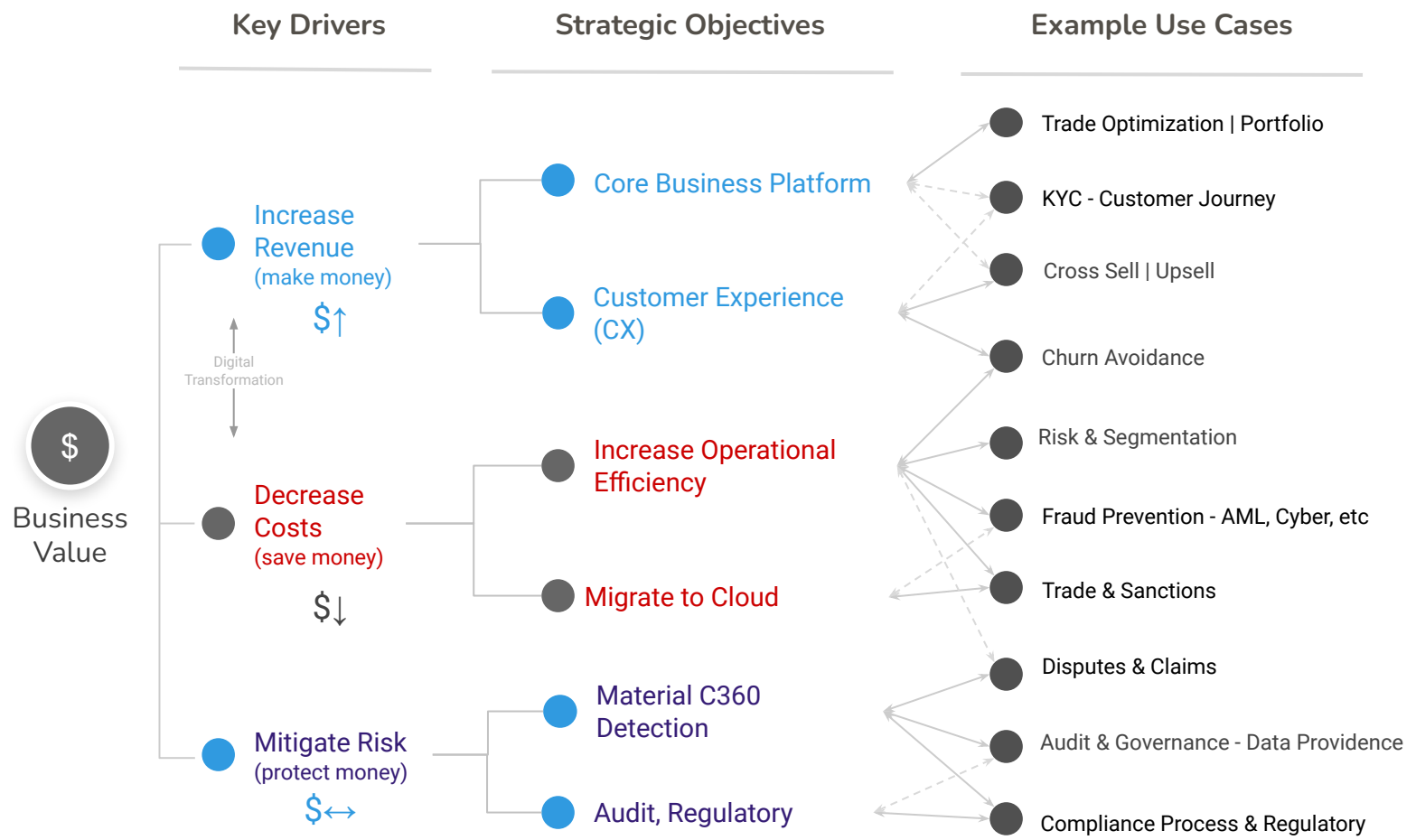
Tree of Pain - Use Cases



Roles / Persona Types

Execs & Mgt

Fraud Analysts

ML & Data Science

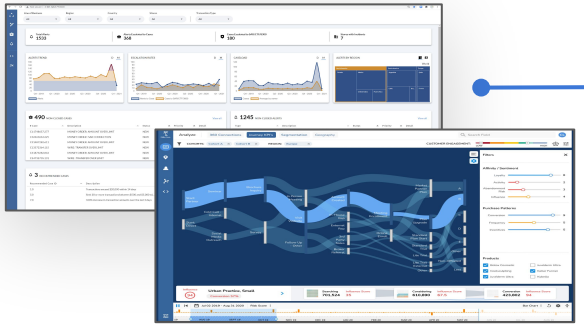
Audit | Compliance

Technical Teams

Visualization - Functionality by User

TIGERGRAPH WORKBENCH

TG STUDIO & INSIGHTS

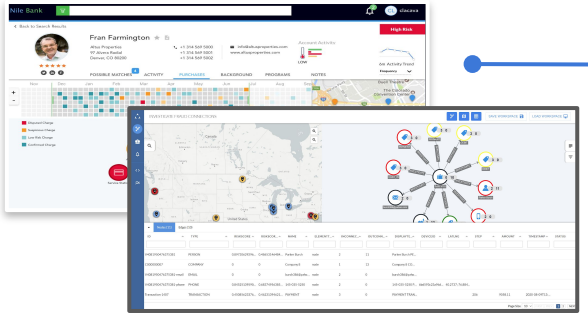


EXECUTIVES

Dashboards & Reports
- Macro Trends
- Drill In Elements

LINE OF BUSINESS

Analytics & Patterns - Case & Alert Queue
- Credit Card
- AML
- Cyber
- Banking Fraud
- Audit & Compliance
- Sanctions & Prosecution

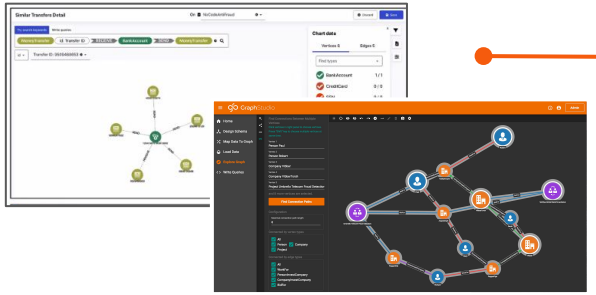


ALERT MANAGEMENT

Alert Management - Alert Builder
- Visual & Non Visual
- Alerts & Updates

TEAM INVESTIGATION

Case & Alert Queue - Detail
- Investigations & Teams
- Findings & Connectivity
- Exploration



ANALYTICS

Analytics & Exploration Workbench
- ML & Algorithms
- Complex analytics and ‘scenarios’

IT | PLATFORM

TG Studio - Insights Viewer
- Data Models
- Graph Ops & Attributes

Customer : Trades & Book of Record

ORACLE teradata. snowflake

ETL (1)

ETL (2)

CyberSource A Visa Solution NICE ACTIMIZE FICO

3rd Party : Scoring

ETL (3)

opencorporates Moody's ANALYTICS LexisNexis

External Data Adverse Media

ETL (4)

US Treasury Central Intelligence Agency UNITED STATES DEPARTMENT OF THE TREASURY FinCEN Exchange

External Data Govt

Entity - Smart Data Linking

TigerGraph

- Data
- Ingest
- Algorithm & GSQL
- Data Models

ML Model

Business logic Model

Graph Model

- Investigation
- Deep Queue & Linkages
- Visualization
- Business Process - Config

Composite Risk Score

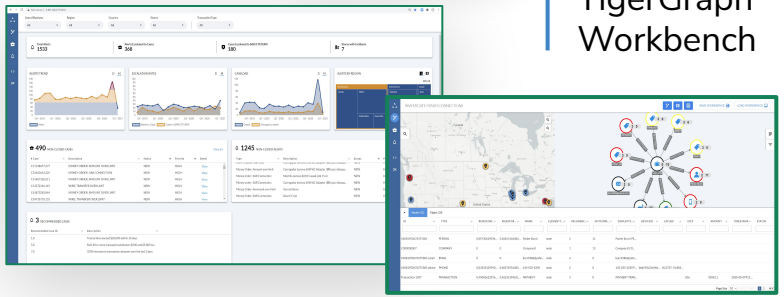
Events & Alerts

IT & Developers

TigerGraph Studio & Insights

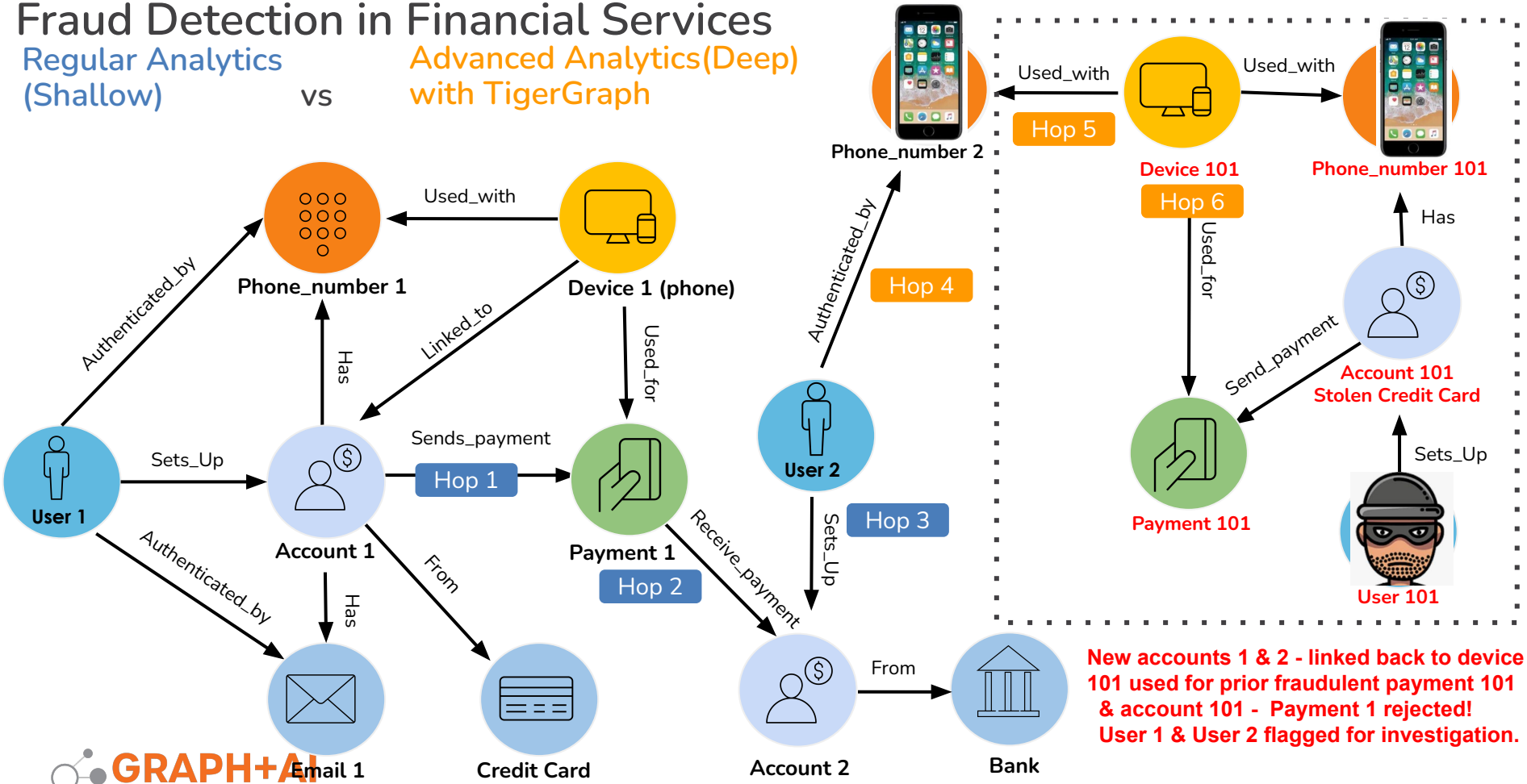
Executives Business Users Investigators

TigerGraph Workbench



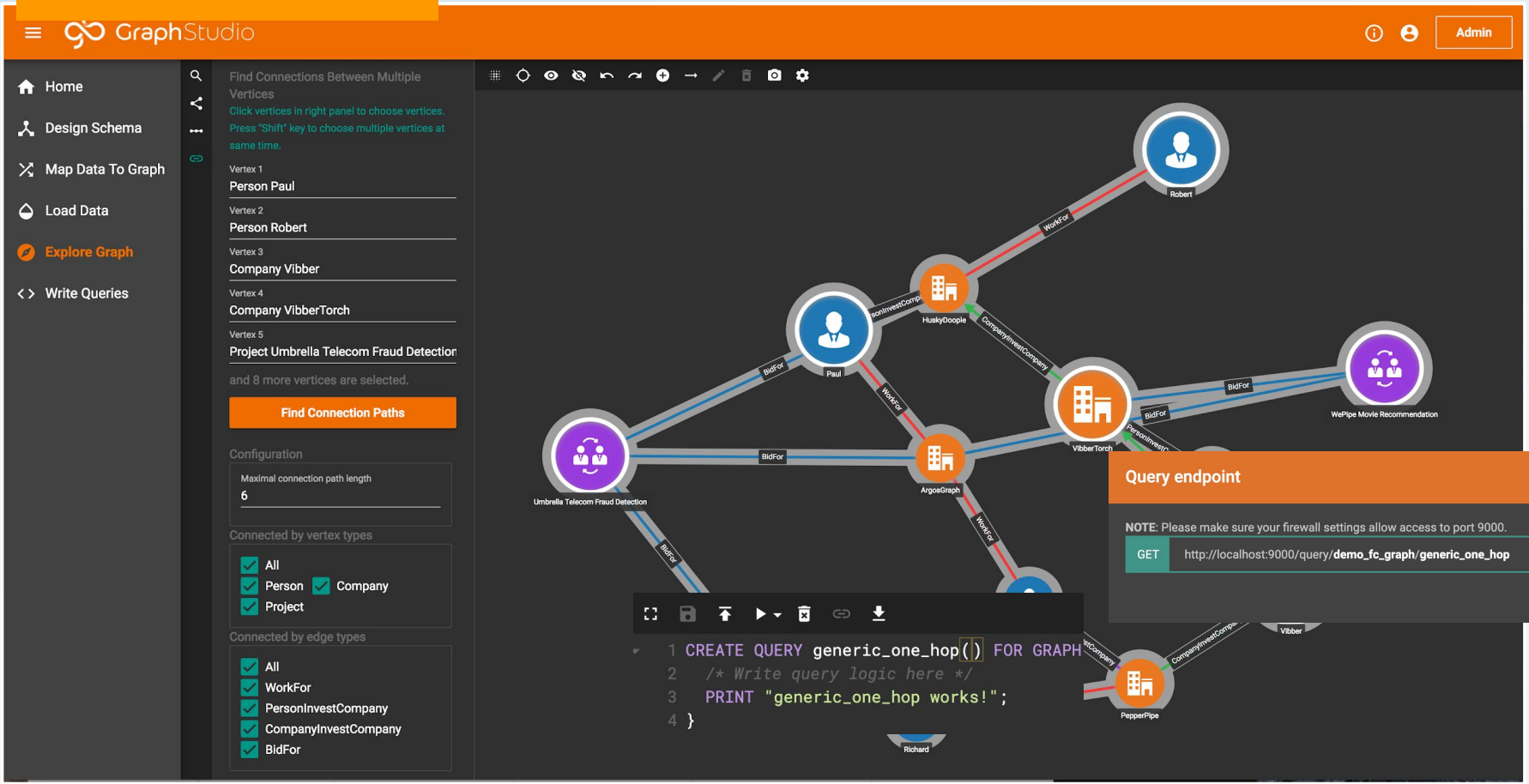
Fraud Detection in Financial Services

Regular Analytics (Shallow) vs Advanced Analytics(Deep) with TigerGraph



New accounts 1 & 2 - linked back to device 101 used for prior fraudulent payment 101 & account 101 - Payment 1 rejected! User 1 & User 2 flagged for investigation.

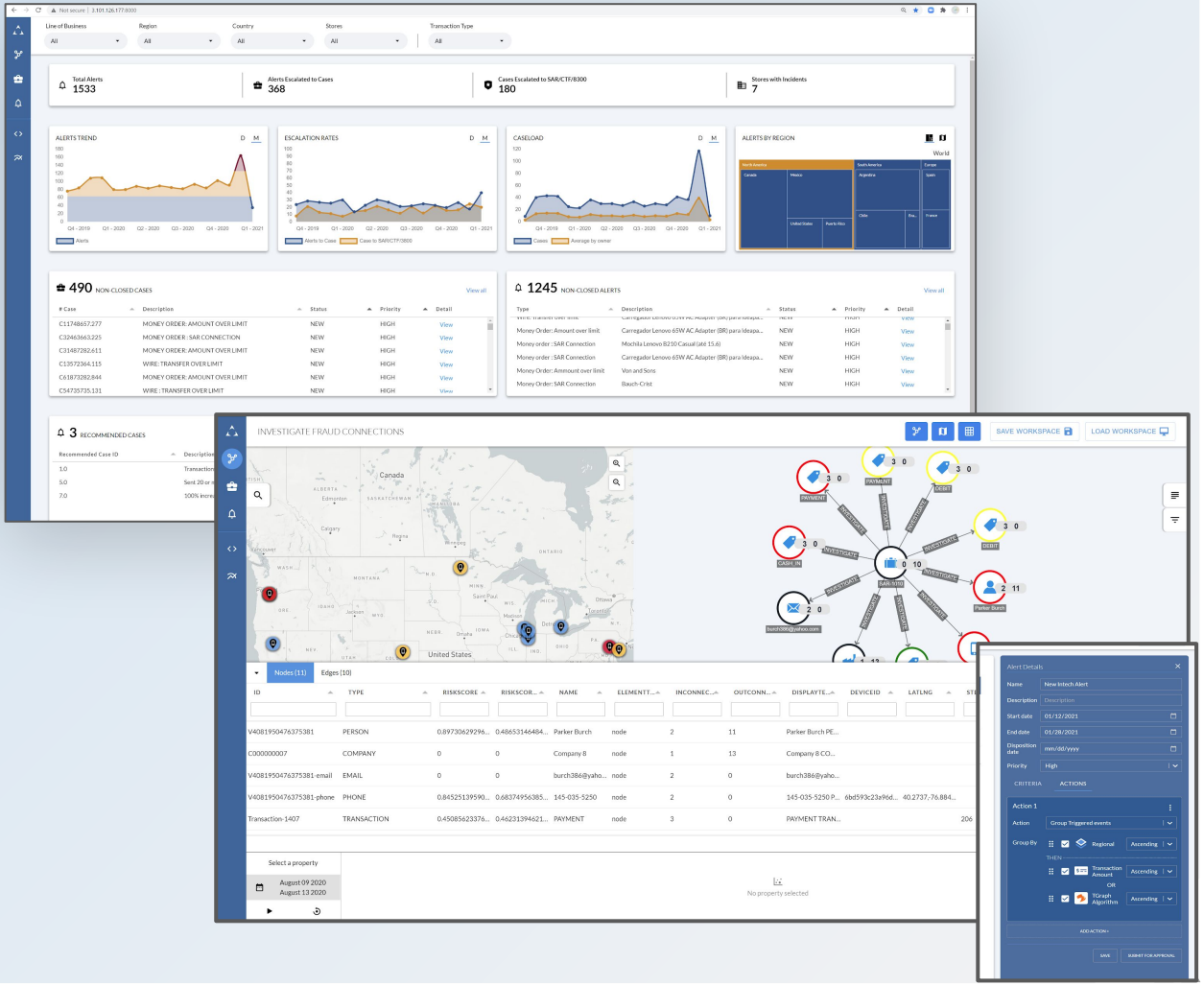
Back-End


GraphStudio
Admin
Home
Design Schema
Map Data To Graph
Load Data
Explore Graph
Write Queries
Find Connections Between Multiple Vertices
Click vertices in right panel to choose vertices.
Press "Shift" key to choose multiple vertices at same time.
Vertex 1
Person Paul
Vertex 2
Person Robert
Vertex 3
Company Vibber
Vertex 4
Company VibberTorch
Vertex 5
Project Umbrella Telecom Fraud Detection
and 8 more vertices are selected.
Find Connection Paths
Configuration
Maximal connection path length
6
Connected by vertex types
All
Person
Company
Project
Connected by edge types
All
WorkFor
PersonInvestCompany
CompanyInvestCompany
BidFor
Robert
HuskyDoople
Paul
VibberTorch
WePipe Movie Recommendation
Umbrella Telecom Fraud Detection
ArgosGraph
PepperPipe
Richard
Vibber
WorkFor
BidFor
CompanyInvestCompany
Query endpoint
NOTE: Please make sure your firewall settings allow access to port 9000.
GET
http://localhost:9000/query/demo_fc_graph/generic_one_hop
OK
1 CREATE QUERY generic_one_hop() FOR GRAPH
2 /* Write query logic here */
3 PRINT "generic_one_hop works!";
4 }

Front-End

Financial Crimes Workbench Demo

- Rules / Alerts
- Dashboards
- Analytics
- Case & Alert Mgt



Q&A Break

Get in touch with us!

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Resources

- TigerGraph Fact Sheet
- Start for Free with TGCloud
- TigerGraph Blog and Resource Hub
- TigerGraph Demo Library
- Analyst Reports