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Graph Databases – Opportunities for Oil & Gas Data

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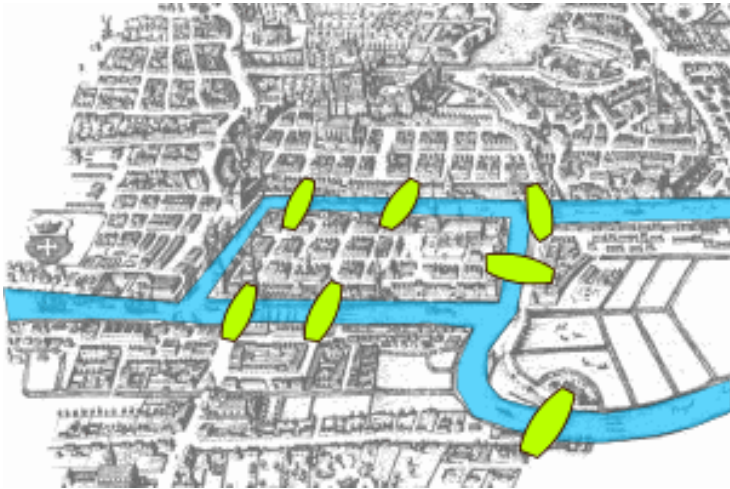
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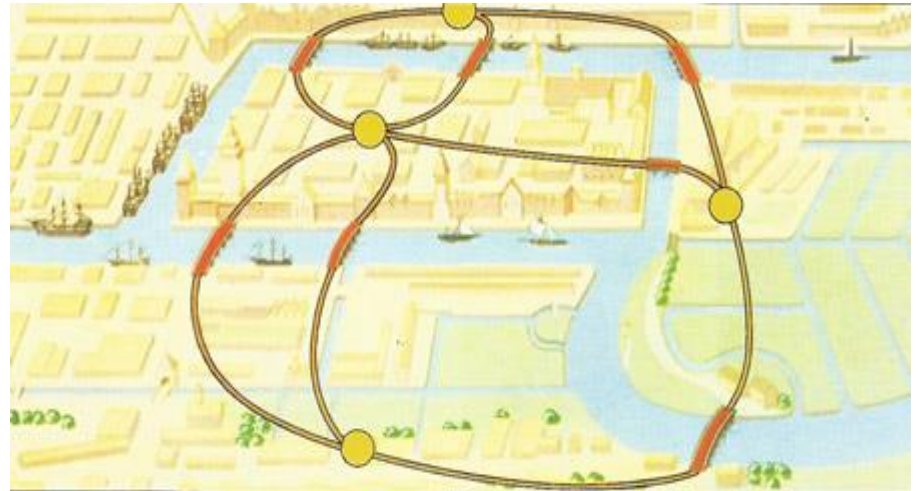
- Brief introduction to Graph Theory
- Some example applications of graphs today
- Current outlook, drivers and graph applications
- Opportunity areas
- Summary

Brief introduction to Graph Theory



Seven bridges of Königsberg, Prussia

A notable problem in 18th century:
Was it possible to take a continuous stroll of all seven bridges without crossing any bridge twice?



Leonhard Euler
1707 – 1783

Euler transformed the map into nodes and edges (that makes up a graph).

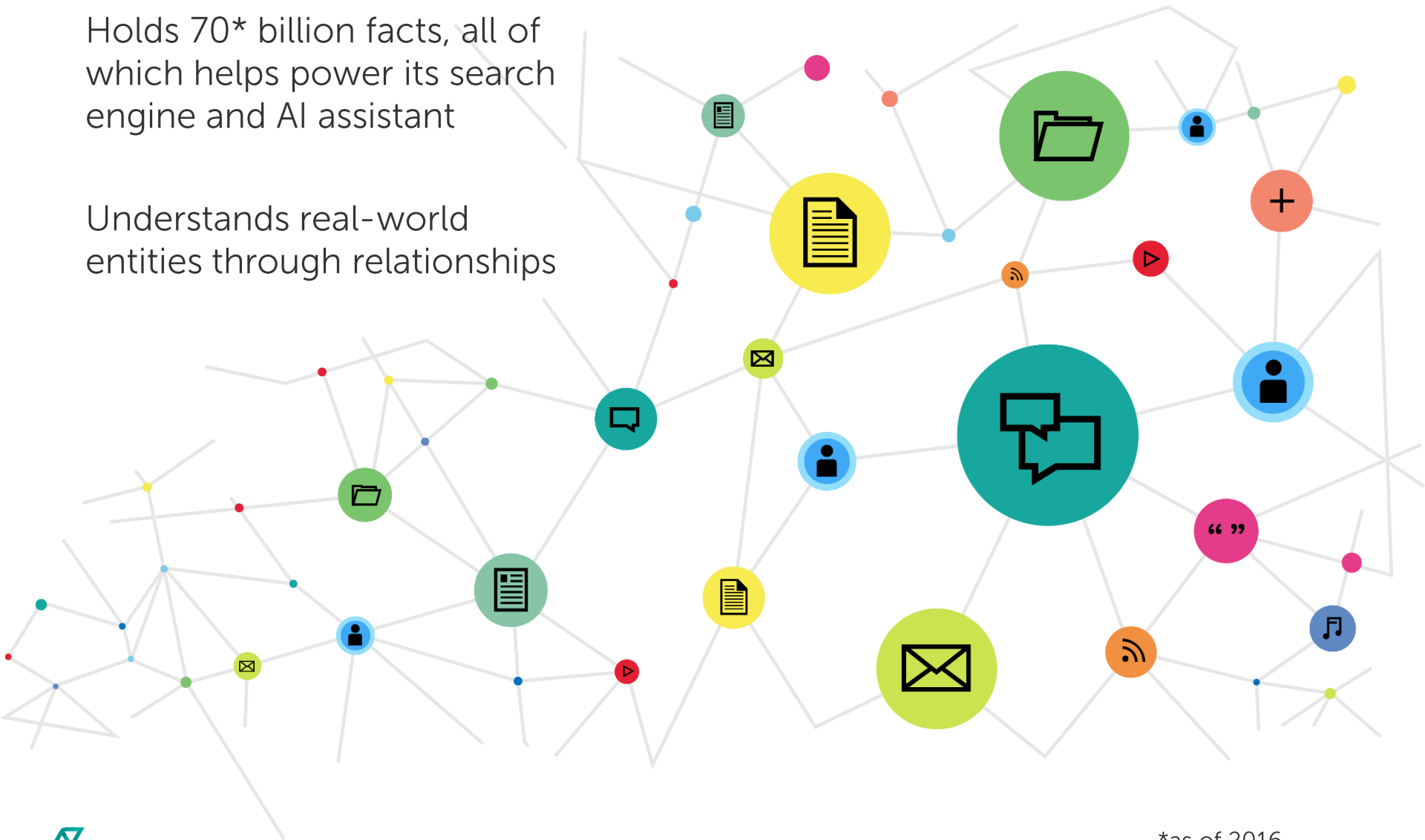
Can a continuous path trace each edge of the graph precisely once?

Some example applications of graphs today

Google's Knowledge Graph Database

Holds 70* billion facts, all of which helps power its search engine and AI assistant

Understands real-world entities through relationships



*as of 2016

About 15,600,000 results (0.65 seconds)

Leonhard Euler - Wikipedia

https://en.wikipedia.org/wiki/Leonhard_Euler ▼

Leonhard Euler was a Swiss mathematician, physicist, astronomer, logician and engineer who made important and influential discoveries in many branches of ...

[Johann Bernoulli](#) · [List of things named after ...](#) · [Pierre-Simon Laplace](#) · [Quarto](#)

Project Euler: About

<https://projecteuler.net/> ▼

A website dedicated to the fascinating world of mathematics and programming.

[Archived Problems](#) · [Sign In](#) · [Recent Problems](#) · [Register](#)

People also ask

What is Euler famous for? ▼

Who was Euler and what did he do? ▼

What did Euler do? ▼

What is the Euler project? ▼

[Feedback](#)

Archived Problems - Project Euler

<https://projecteuler.net/archives> ▼

Problems Archives. The problems archives table shows problems 1 to 600. If you would like to tackle the 10 most recently published problems then go to Recent ...



Leonhard Euler

Mathematician

Leonhard Euler was a Swiss mathematician, physicist, astronomer, logician and engineer who made important and influential discoveries in many branches of mathematics like infinitesimal calculus and ... [Wikipedia](#)

Born: April 15, 1707, [Basel, Switzerland](#)

Died: September 18, 1783, [Saint Petersburg, Russia](#)

Education: [University of Basel](#) (1720–1723)

Children: [Johann Euler](#), [Christof Euler](#), [Charlotte Euler](#), [Karl Euler](#), [Helene Euler](#)

Spouse: [Salome Abigail Gsell](#) (m. 1776–1783), [Katharina Gsell](#) (m. 1734–1773)

Facebook's Social Graph



Relationship between people and things

Personalized recommendations
- Highly targeted services (eg. ads)

Mentoring Program:
raise job prospects through mentorship

When graph database technology really is rocket science



Target Mars: NASA's Project Orion

Use case: development of the up-righting mechanism on the Orion spacecraft.

How to make it work was lost in NASA's 60 years of engineering knowledge data

With Graph Database, NASA found the information in four hours, which otherwise could have taken two years

Current outlook

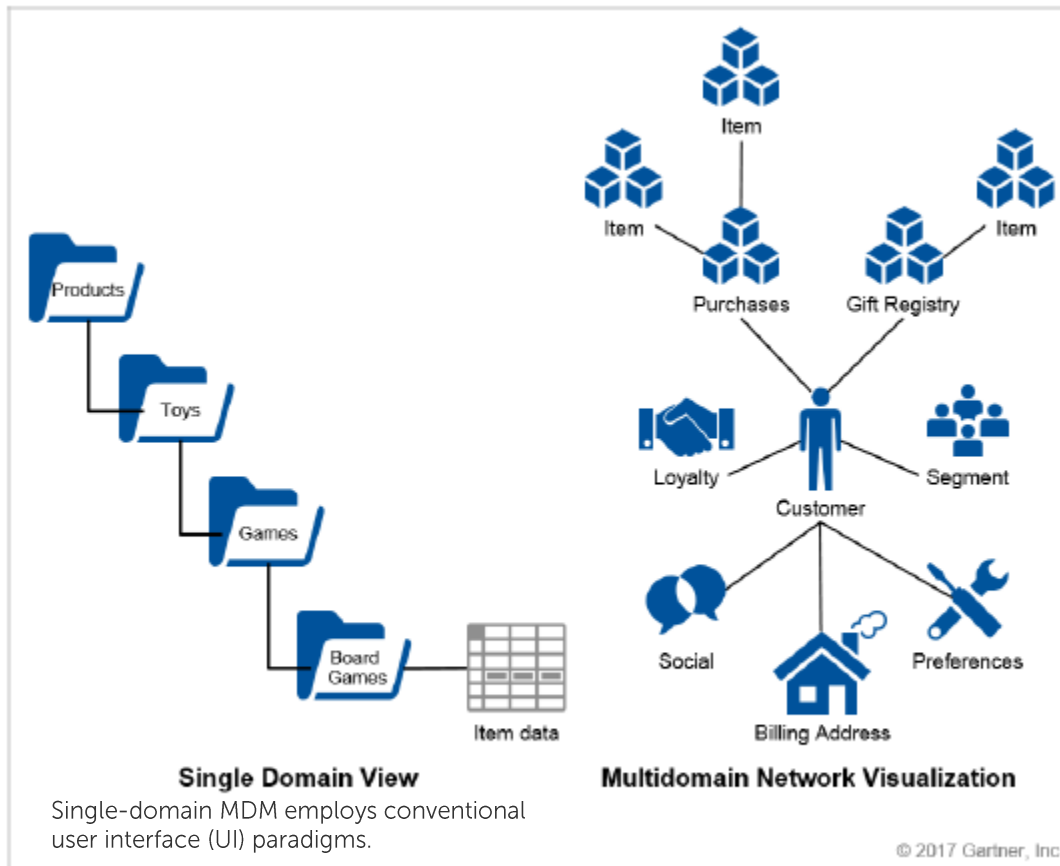
The more information — the greater volume, variety, volatility — that organizations create and collect, **the harder it is to find** the information they need.

Data is spread across **disparate databases**, file servers, content management systems, enterprise file sync and share, emails, wikis, data dictionaries, metadata tools, glossaries, and new technologies such as Hadoop.

Drivers

The growing adoption of graph analysis is largely driven by the need to find **insights across vast amounts of heterogeneous data**, including unstructured data, and by the expanded capabilities, computational power and adoption of graph databases, which present an ideal framework to store, manipulate and analyze graphs.

Conventional paradigms are no longer effective



Source: Gartner (February 2017)

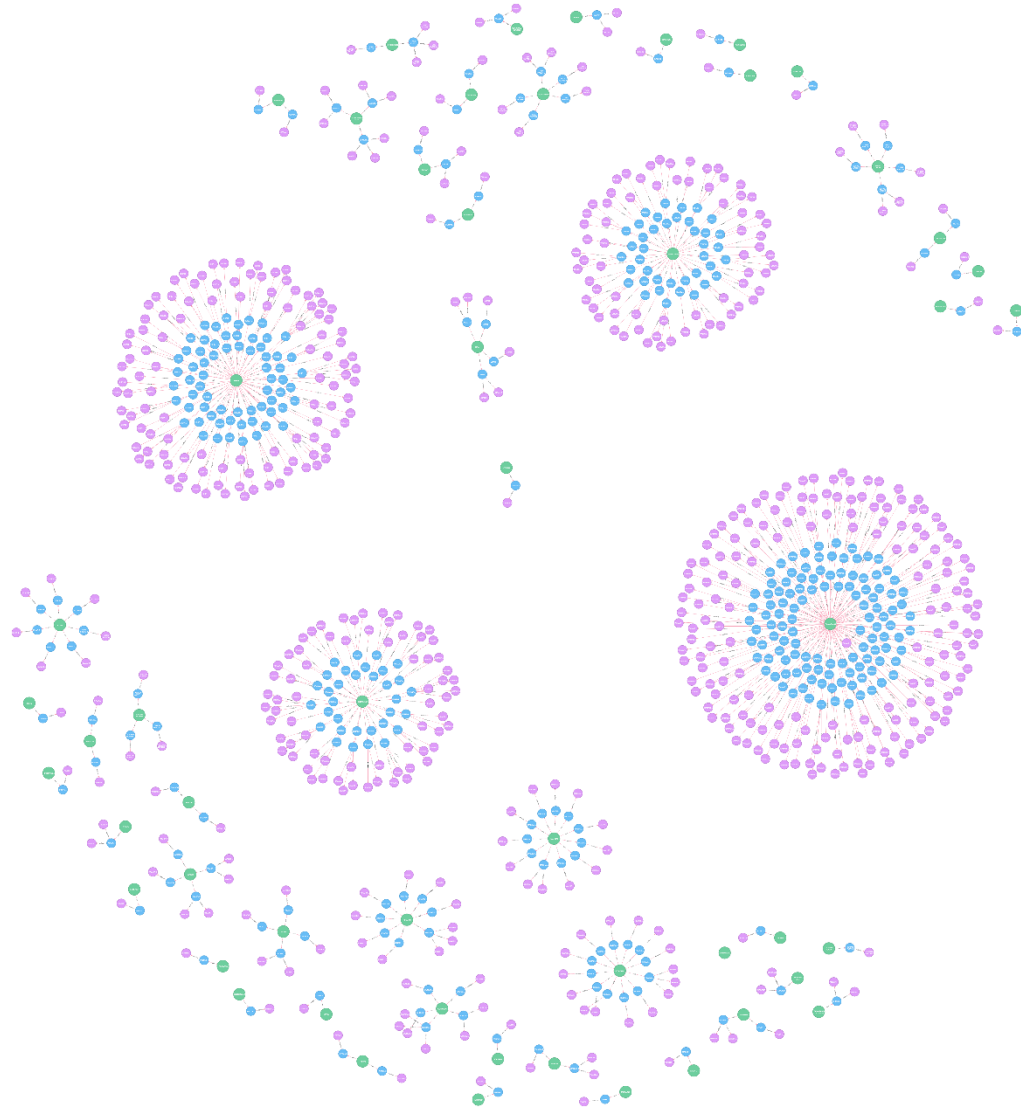
Through the ability to connect entities across domains, businesses can develop new opportunities.

Graph enables relationship discovery and mapping

By understanding data connections, organizations can unlock the value of multidomain and multivector MDM.

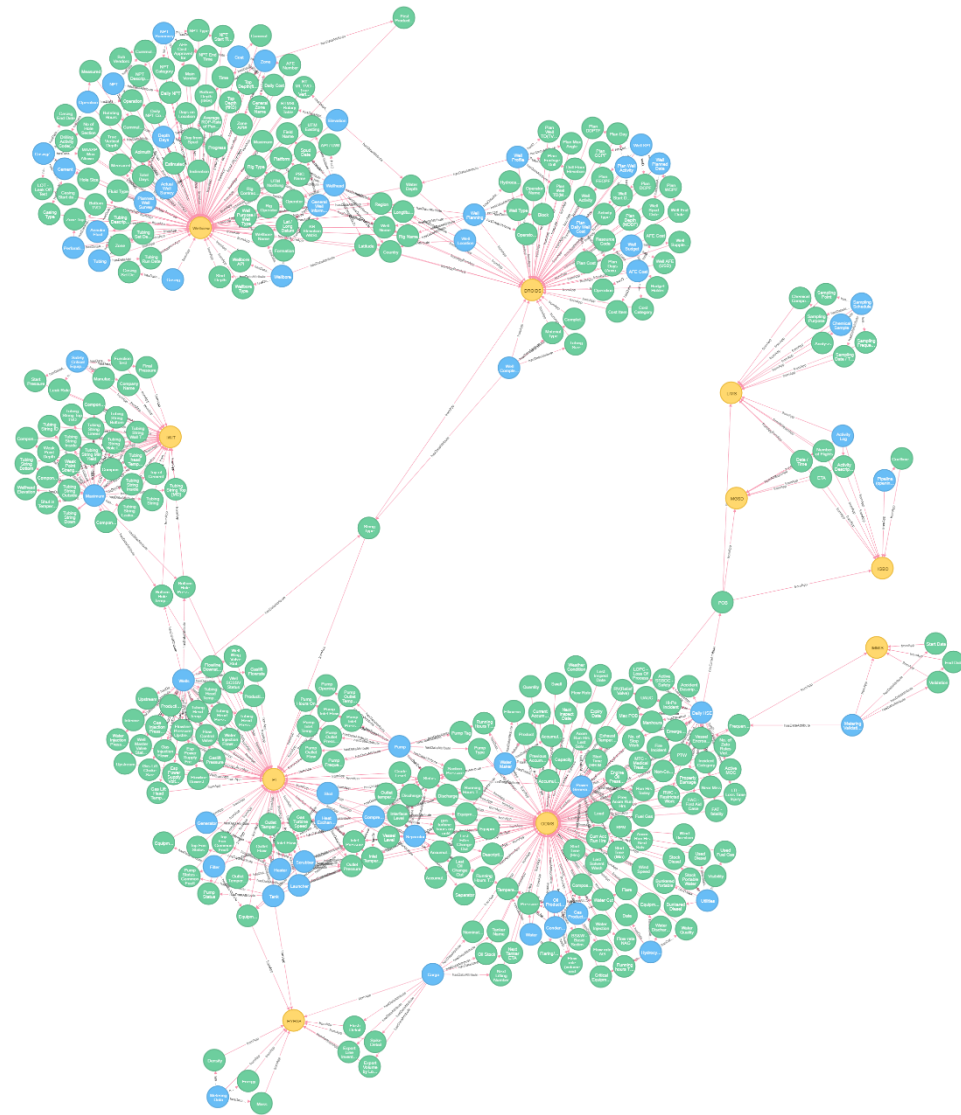
Well Header Graph

- Well Header Data is stored in both structured and unstructured text (PDFs)
- There are many variations in attributes' terms and metrics
- Graph is applied to connect disparate data sources
- Identify similarities
- Harmonize terminology variations
- Recognize patterns
- Detect outliers



Applications Graph

- Large number of applications are used to serve the needs of business functions across the group
- Are there any similarities between each application?
- What are their relationships?
- How can they be rationalized?
- Which data types are commonly used?



Other opportunity areas

- Master Data Management
- Cognitive search
- Outlier detection
- 360° view of Asset
- Identity & Access Management
- Recommendations
- Dependencies identification
- Failure analysis
- Knowledge discovery
- Domain expert knowledge retention
- Lessons Learned extraction
- Resource Optimization
- Project Management

Summary

- Data is growing at a fast pace. It's getting harder to find the right data across disparate data sources.
- Graph database breaks the silo-ness of data to unlock insights of connected data.
- There are many opportunities for Oil & Gas data to derive values from data relationships.



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Thank you