

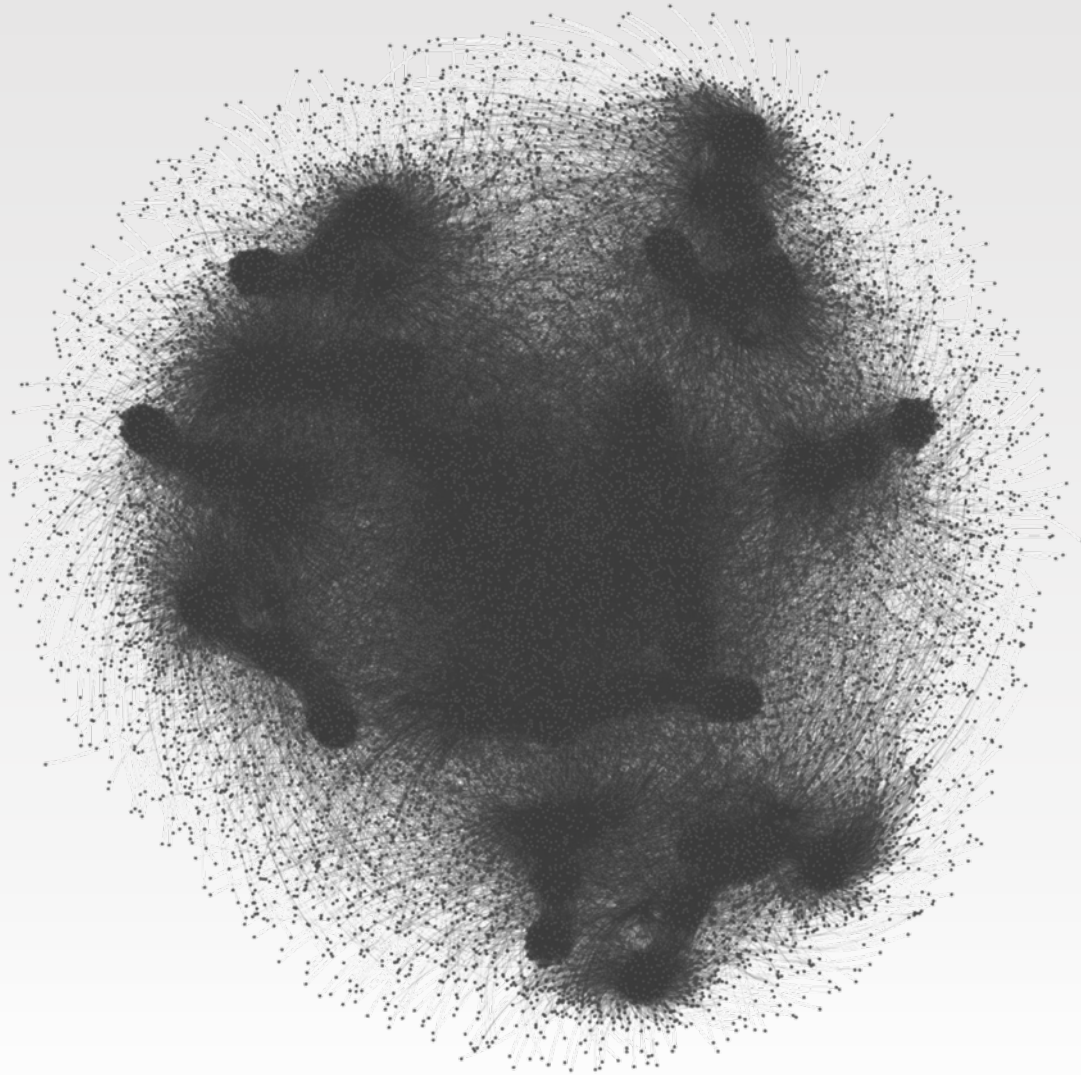


Visual Analytics of Large Knowledge Graphs

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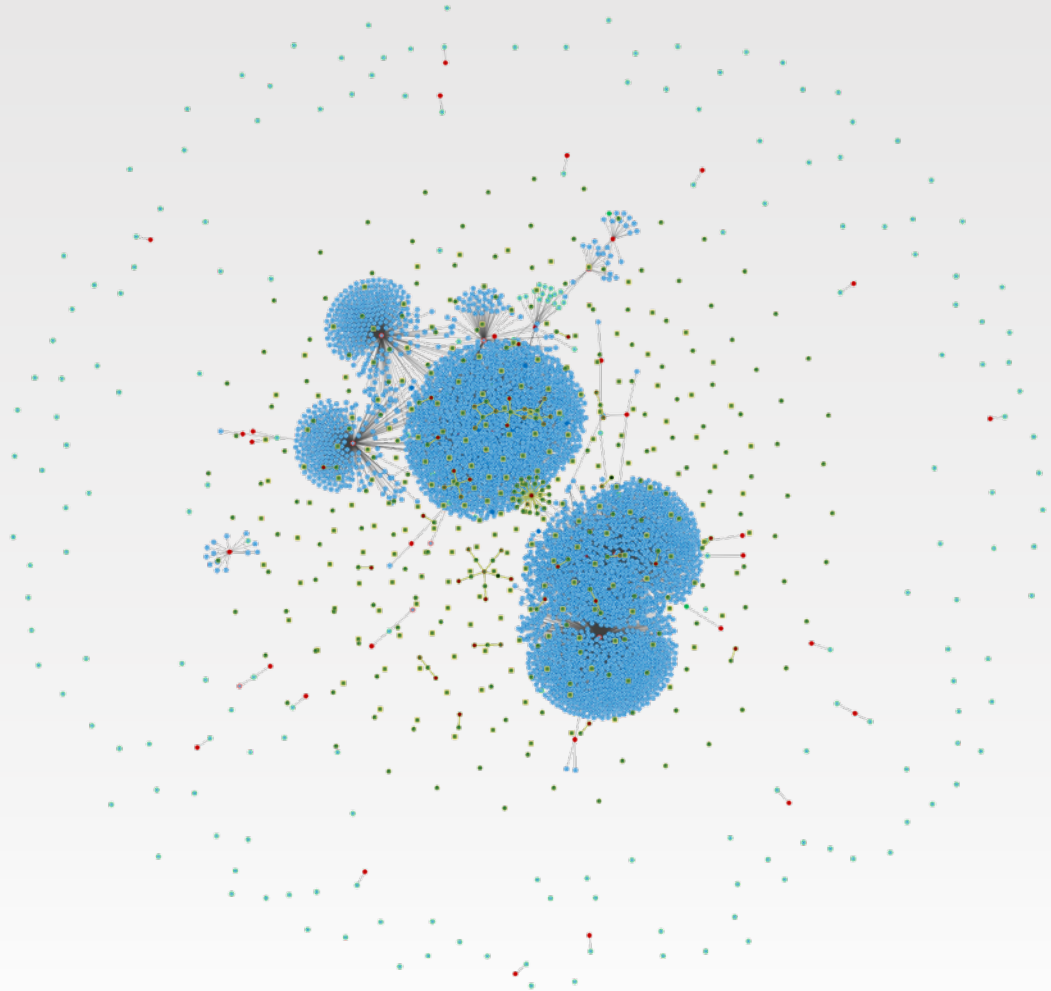
How to Connect the Dots in a Knowledge Graph?



Network Rendering?

- + good for small graphs
- + data-driven
- does not scale
- poor expansion control
- disorientation due to node rearrangement
- no reasonable overview

How to Connect the Dots in a Knowledge Graph?



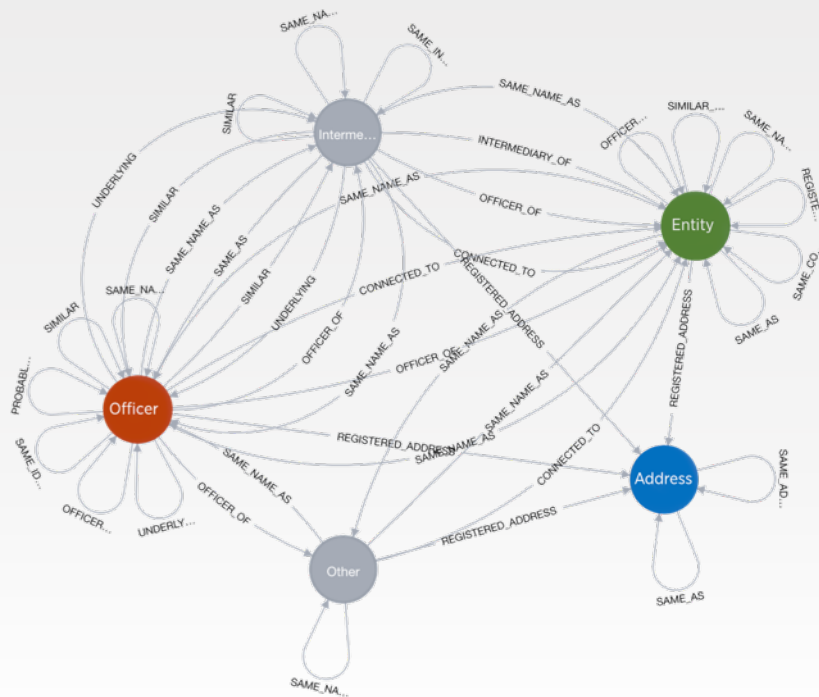
Panama Papers:

→ ICIJ (<https://www.icij.org>)

“The **officers** that share an **address** with an **entity** in Germany”

How to Connect the Dots in a Knowledge Graph?

```
MATCH
  (e:Entity) -[:REGISTERED_ADDRESS]->(a:Address)
  <-[:REGISTERED_ADDRESS]-(o:Officer)
WHERE e.countries =~'.*(?i)Germany.*'
RETURN DISTINCT e.name, a.address, o.name
```



Query language?

- + very expressive
- + fine adjustable result scope
- requires training
- barely data driven
- unsuitable to find the unexpected or points of interest

How to Connect the Dots in a Knowledge Graph?

The screenshot shows a search interface for 'Germany'. At the top, there is a search bar with 'Germany' entered and a 'Search' button. Below the search bar, there is a 'Navigation Map' section with a tree view showing 'type' (ENTITY, REGISTERED_ADDRESS, ADDRESS) and 'Filter by:' (type, REGISTERED_ADDRESS, closed_date, company_type, countries). The 'REGISTERED_ADDRESS' facet is expanded, showing sub-facets: node_id, valid_until, countries, and country_codes. The search results list several entities with their types and country codes.

Entity Name	Type	Country Code
GERMANY-BAHAMAS INVESTMENT & DEVELOPMENT CO LTD	BAH	
GRAMSEC (GERMANY) LIMITED	BAH	
SPATZIE ARUBA-GERMANY BEER BREWERY RESTAURANT NV LIMITED LIABILITY COMPANY	AW	
BORK Germany, Ltd.	CI	VG
Absolute Germany Fund Limited	CE	KY
CIT Founder Germany I Limited	BAH	
CIT Germany Fund I Feeder GP Limited	BAH	
CIT GP Germany I Limited	BAH	
NEW GERMANY TRADING, LTD.	BAH	
SWISS SECURITIES BROKERAGE GROUP (GERMANY) INC.	BAH	
SPATZIE ARUBA-GERMANY BEER BREWERY RESTAURANT NV LIMITED LIABILITY COMPANY		

Faceted navigation?

- + easy to use
- + data driven
- does not show relationships
- no suitable overview

How to Connect the Dots in a Knowledge Graph?

Germany

Navigation Map:

type
 ENTITY

Filter by:

▼ 🔍 type

- ADDRESS (392)
- ENTITY (217)
- OFFICER (7)

[More options](#)

Germany

Navigation Map:

type
 ENTITY

Filter by:

▼ 🔍 type

- ADDRESS (392)
- ENTITY (217)
- OFFICER (7)

[More options](#)

▼ ⚙️ 🔍 REGISTERED_ADDRESS

- ADDRESS (45)

Germany

Navigation Map:

type
 ENTITY
REGISTERED_ADDRESS
 ADDRESS

Filter by:

▼ 🔍 type

- ADDRESS (392)
- ENTITY (217)
- OFFICER (7)

[More options](#)

▼ ⚙️ 🔍 REGISTERED_ADDRESS

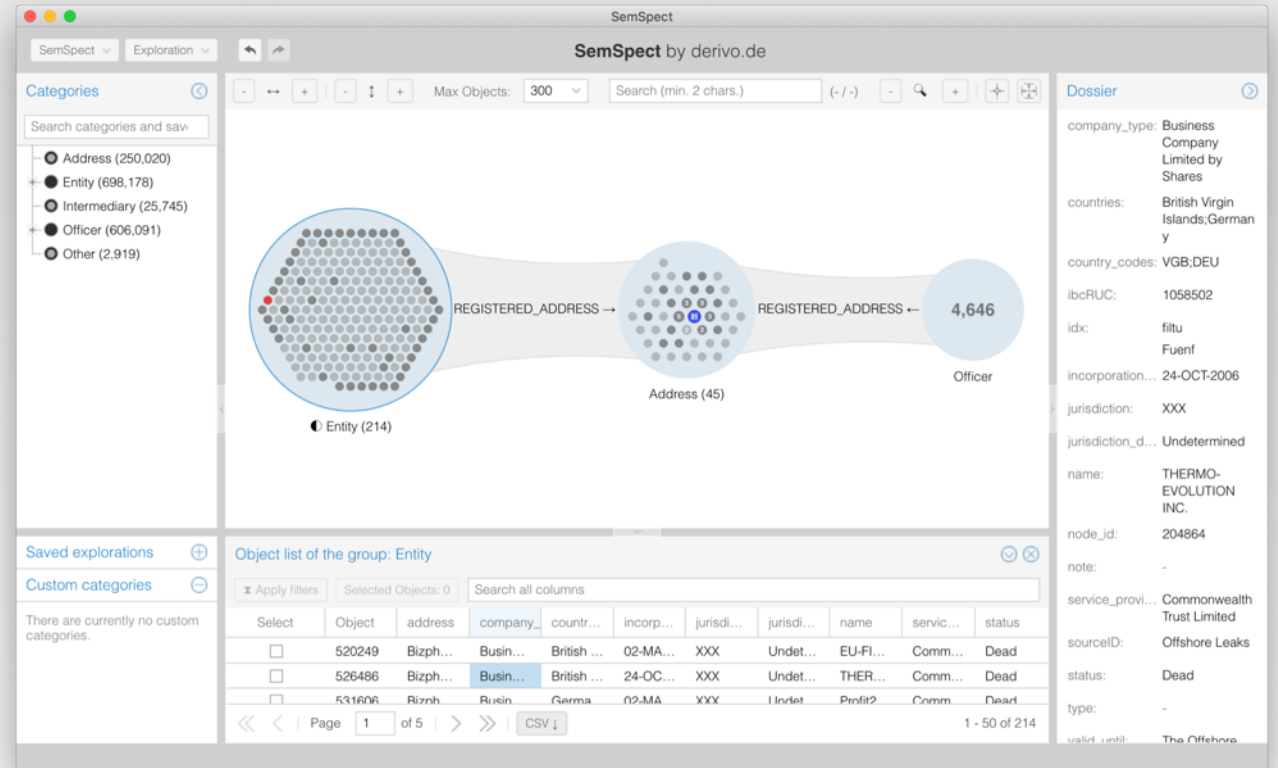
- ADDRESS (45)
 - ▶️ ⚙️ 🔍 sourceID
 - ▶️ ⚙️ 🔍 node_id
 - ▶️ ⚙️ 🔍 valid_until
 - ▶️ ⚙️ 🔍 country_codes

▶️ 🔍 closed_date	NEW GERMANY TRADING, LTD. BAH
▶️ 🔍 company_type	SWISS SECURITIES BROKERAGE GROUP (GERMANY), INC. BAH
▶️ 🔍 countries	SPATZIE ARUBA-GERMANY BEER BREWERY RESTAURANT NV LIMITED LIABILITY COMPANY

Aggregated Visual Exploration

Interactive, data driven visualization and analysis via:

- grouping of nodes
- selective exploration
- aggregation of relations
- on-demand details
- sophisticated filtering
- <http://www.semspect.de>



Wrap-Up

- ▶ The right tool depends for your requirements!
- ▶ Key factors for visual analytics of large KGs
 - data-driven exploration options
 - scalability of visualization paradigm
 - overview first – details on demand
- ▶ SemSpect
 - RDF version: full OWL RL reasoning support
 - Neo4j version:
 - Graph App for Neo4j Desktop
 - currently in beta