Graph Technology and Anti-Money Laundering

About Monocle

Monocle is an independent, results-focused management consulting firm specialising in banking and insurance with two decades of experience working alongside industry leading companies around the world. With offices in London, Amsterdam, Cape Town and Johannesburg, we service our clients across the United Kingdom, Europe, Scandinavia, Asia, South Africa and much of Sub-Saharan Africa.

Monocle's expertise in data management and governance, alongside our deep knowledge of market conduct regulation, makes us a trusted partner for our clients' financial crime and AML change initiatives.

This includes the innovative approach to suspicious transaction monitoring through graph databases and algorithms. For further understanding into this topic, download and read our insights paper, *Graph Technology and AML: A New Perspective on Financial Crime*.

The Current State of AML

As part of financial institution's regulatory obligation to monitor for illegal money laundering practices in their operations, there has been continuous investment in suspicious transaction monitoring (TM) solutions. These types of systems that target specific transaction behaviours must process millions of transactions daily. Yet, they are often constrained by a lack of flexibility in the functionality of their transaction monitoring rules and the underlying databases.

This has led to high levels of false positive suspicious transaction reports that overwhelm the investigation process, which is further hampered by data inefficiencies and rigidity.

The Potential of Graph Technology

Graph technology is emerging as an innovative data solution to store, manage and analyse data through a network of relationships. Graph databases are entity orientated rather than table orientated like their relational databases counterparts. They therefore allow for the modelling of relationships between entities (accounts, clients, customer details).

Knowledge graphs (how data is modelled in a graph database) are built using "triples" or "triplets", consisting of nodes (the subject and the object) and edges (the relationship between the subject and object).

Triple/Triplet

These models can be built to scale, with additional dimensionality and attributes to create a comprehensive network of relationships and data. Importantly, knowledge graphs do not rely on conventional data joins to connect datasets but are inherently interconnected through their edges. Graph technology offers considerably faster and seamless ad-hoc querying when identifying and analysing relationships and networks that would often be unattainable through traditional SQL and relational databases.

Developments in Graph Technology

Gartner predicts that graph technology will reach majority adoption in three to six years and is set to have a substantial impact as a technology, driving business, process, and methodology changes in the market.

Graph Algorithms and AML

Money laundering by its nature is a complex network of transactions between accounts which makes it an ideal use case for graph databases and knowledge graphs. The appeal of this technology is the capability to connect the dots and identify hidden networks across various data sets using mathematical calculations in the form of graph algorithms.

The most common algorithms are:

Pathfinding: These graph algorithms are used to explore routes between nodes in order to identify optimal routes and the shortest paths between a starting point and a destination. This can be used to identify payment trails between nodes of interest such as political exposed persons.

Centrality: These algorithms are designed to measure the impact or importance of certain nodes in a network and have been used extensively for social network analysis. This is useful to determine key actors amongst AML networks.

Community Detection: Also known as clustering, these algorithms can identify communities of nodes that share similar edges. This can be used to identify money laundering syndicates' intermediary accounts due to their connection to other suspicious parties.

AML Use Cases

- **Association with Suspicious Entities:**

Using pattern-matching scores, direct relationships are identified between parties and then scored based on their proximity to suspicious entities. These scores can be set up to identify relationships across transactions and the flow of money to politically exposed persons (or the flow of unusual transactions across high-risk geographies or unrelated industries such as an SOE to a charity or a private individual).

- **Shared Attributes:**

The application of graph algorithms can be further expanded to find similarities in various attributes, including personal details such as phone numbers, physical addresses and IP addresses. Analysts can then determine relationships once a shared attribute is identified between separate parties' accounts, which can highlight cases of fraudulent identity by criminals who have set up multiple accounts to be used for money laundering activities.

- **Transaction Monitoring Support:**

Significantly, graph technology can support other AML monitoring approaches by developing metrics or variables across nodes that can be fed into your traditional rules-based transaction monitoring systems or machine learning models. These metrics help to build more complex rules, as well as provide valuable insights to train ML models to identify hidden AML nuances and trends not yet identified by current typologies.

Monocle's Approach and Where to Start

Introducing any new technology can be a daunting task, however, graph databases and knowledge graphs are supported by a reputable list of vendors including Oracle, Neo4J and SAS.

1. Database and Data Model Setup:

Setting up a graph database will require the development of your data model (see the full insights paper for more information). This requires determining what will constitute your nodes (entities) and your edges (relationships). From an AML perspective, it makes sense to establish your customers and clients as nodes, and your transactions as edges.

Once your data model is developed and your data has been sourced and standardised, you can build out your knowledge graph.

2. Graph Algorithms:

The resulting knowledge graph will reveal your network of transactional relationships across your clients. This is the view of your data on which you will apply your graph algorithms, as mentioned, above to identify AML activity directly or produce metrics that support your established transaction monitoring systems.

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