Follow the (digital) money

A federal guide to the power of analytics in the digital asset economy

Cryptocurrencies and other blockchain-based digital assets play an increasingly significant role in financial markets and the broader economy. They are also becoming a more frequent source of regulatory concern and criminal activities. These trends present substantial challenges for federal regulators and law enforcement alike. At the same time, for those who learn to leverage the insights these complex transactions generate, the trends also create new opportunities to perform their missions more effectively. Over the months and years to come, federal agencies will need to scale and institutionalize their early advances in understanding these transactions to keep pace with the market's rapid growth.

Those at the forefront of tackling these issues have already discovered that specialized analytical tools can unlock tremendous insight, providing real-time visibility and investigatory focus into these often-chaotic markets.

The next step forward is leveraging data analytics at greater scale to eliminate the perception of anonymity on a blockchain and bring a higher level of transparency to these marketplaces. By mastering analytic tools, investigators and regulatory professionals are empowered to peer deeper into the data, driving actionable insights supporting mission goals.

This report examines the types of insights that blockchain analytics can deliver. We also share steps federal agencies can take to scale their efforts and increase operational maturity. These steps can empower federal leaders to understand, regulate, and monitor these markets more effectively without inhibiting appropriate business activity and economic growth.

An alternative financial universe emerges

Blockchain and distributed ledger technologies have a variety of uses, such as supply chain management and health information exchange, but their most significant role today is as financial instruments and means of trade. These applications rely on cryptography to create digital assets and cryptocurrencies that can be shared securely through blockchain-based transactions. This creates alternative financial systems that replace traditional centralized control models with more transparent and automated finance networks reliant on a distributed, consensus-based governance structure.

Since the introduction of Bitcoin in 2009, digital assets and cryptocurrencies have emerged as both currencies and speculative investment vehicles, often at the same time. In 2015, the U.S Commodity Futures Trading Commission formally determined that virtual currencies like Bitcoin should be viewed and regulated as commodities.

Cryptocurrencies had a value of $1.7 trillion as of January 2022, according to Morningstar's 2022 Cryptocurrency Report. This equals almost 10% of the total U.S. dollar supply of approximately $20 trillion in circulation, based on Federal Reserve data. And there are reportedly over 10,000 distinct cryptocurrencies worldwide as of February 2022, up from just 66 in 2013. Furthermore, the Atlantic Council is tracking over 100 countries, representing 95 percent of global GDP, that are exploring, piloting, or have launched their own Central Bank Digital Currencies (CBDCs). And the user base for cryptocurrencies has been proliferating during the past year, reaching 12% of the U.S. population, according to the Federal Reserve's Economic Well-being of U.S. Households in 2021 report.

This growth also demonstrates the experimentation underway, as entities work to deliver on the promise of digital assets to reduce transactional costs, aid the unbanked, and foster financial innovation. In many cases, these innovators are working beyond what's envisioned by existing regulations, creating new challenges for regulators. This creates additional needs to monitor these emerging markets to understand how they may impact or benefit society and what regulations may be needed.

The growing role of digital assets and cryptocurrencies across nearly all facets of the economy is already impossible to ignore for federal agencies. For example, Chainalysis reports that theft of cryptocurrencies reached $3.2 billion in 2021, a fivefold year-over-year increase. Furthermore, the crypto intelligence firm noted that money laundering from cybercrimes like ransomware attacks reached an additional $8.6 billion in 2021. While this amount pales in comparison with the $800 billion to $2 trillion laundered annually, according to estimates from the U.N. Office on Drugs and Crime, it also underscores the potential to make an existing challenge even harder to solve.

As digital assets and cryptocurrencies become more prominent, blockchain analytics can support federal agencies in enforcing regulations, especially in areas like anti-money laundering (AML) that align transactions with specific entities. It will be crucial to law enforcement efforts to "follow the money," as bad actors seek to exploit the presumed anonymity of crypto transactions.

A recent White House Executive Order on [Ensuring Responsible Development of Digital Assets](#) shows just how far crypto adoption has come. Citing the "explosive growth" of digital assets, the order points to the need for the U.S. government to "maintain technological leadership in this rapidly growing space, supporting innovation while mitigating the risks for consumers, businesses, the broader financial system, and the climate."

Traditional financial firms are also buying into the idea and already recognizing that blockchain analytics are critical to the emerging ecosystem. For example, MasterCard [acquired blockchain analytics provider CipherTrace](#) as "security and fraud detection provide additional transparency and support for digital assets ecosystems."

At the same time, federal law enforcement is already leveraging analytics to ensure bad actors do not exploit digital assets. The U.S. Justice Department, for instance, reports on successful efforts to unravel a $4.5 billion bitcoin heist.

"In a futile effort to maintain digital anonymity, the defendants laundered stolen funds through a labyrinth of cryptocurrency transactions," Deputy Attorney General Lisa O. Monaco said in a statement to the press. "Thanks to the meticulous work of law enforcement, the department once again showed how it can and will follow the money, no matter what form it takes."
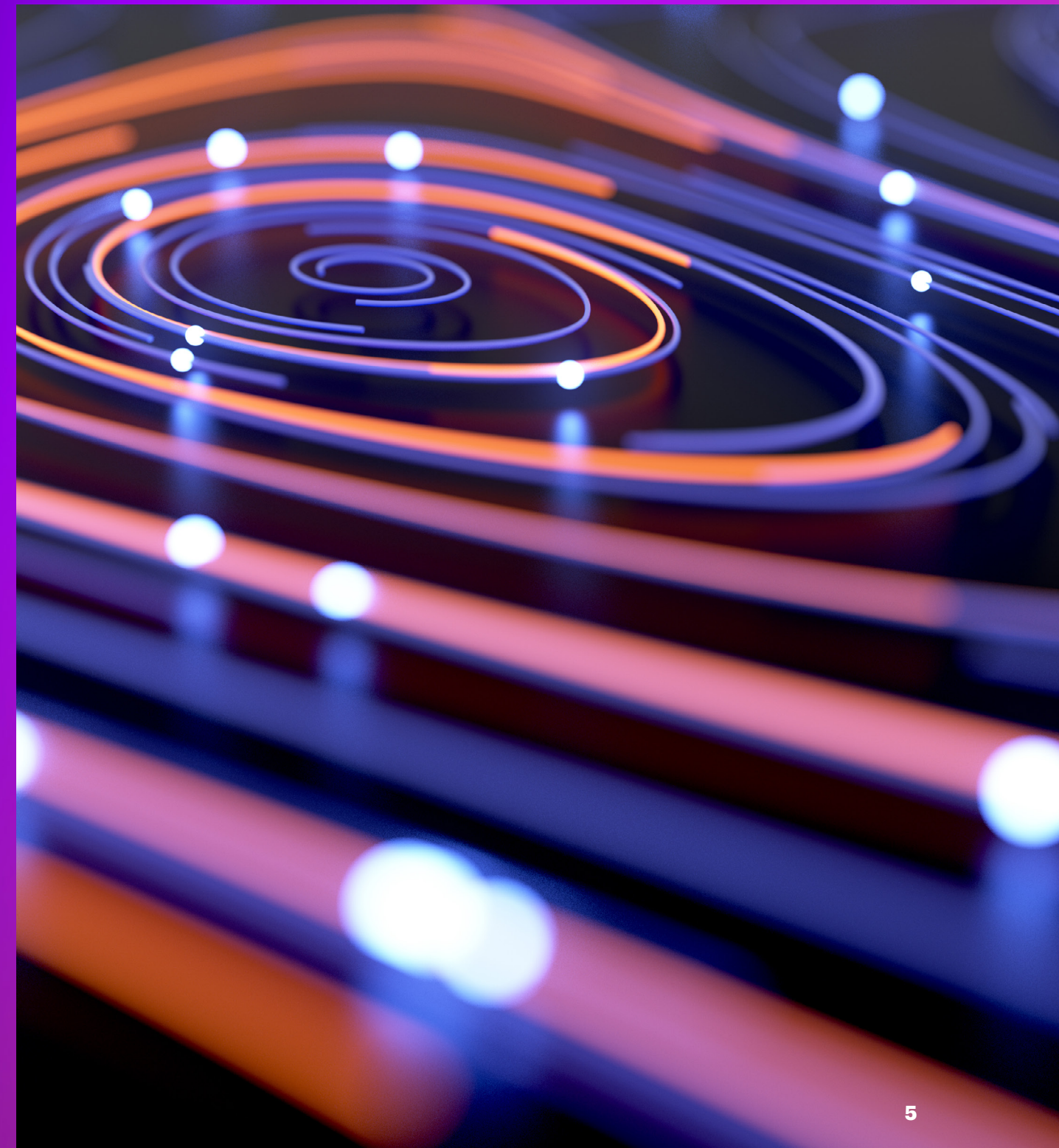
Analytics capabilities continue to play a vital role in the effort to disrupt that flow. The FBI, for example, recently announced the creation of a Virtual Assets Unit (VAU), which it describes as a "nerve center" for the bureau's virtual currency programs. Technology and operational support will flow through the VAU to other divisions, with virtual currency experts and cross-divisional resources embedded in a task force setting.

Likewise, the Securities and Exchange Commission (SEC) recently announced plans to "hire more crypto cops to fight digital frauds." These actions point to a fundamental reality—federal agencies have demonstrated an ability to connect the dots and follow the money but will require significant additional resources when transactions number in the trillions.

DEFINITION:

Breaking down blockchain

More than just a digital database, blockchain is a powerful record-keeping tool. As a peer-to-peer, decentralized ledger, it creates an unchangeable record of transactions without any third-party intermediary. Each new transaction is stored in a block, which becomes another link in the chain of existing records. It's instantaneous: All parties see updates to the blockchain simultaneously. It's reliable in that there is no central point of potential failure. And as a shared ledger, it also offers ready visibility into these transactions.

Blockchain analytics shine a light

Data analytics tools make it possible to go deep into the complex web of transactions in the distributed ledger technology, surfacing the jumps between transactions and identifying the interrelationships between the potentially thousands of transfers. As adoption grows, there's an urgent need for analytics to unlock more profound insight from blockchain activity, taking full advantage of its shared nature and the greater transparency that it offers.

THE NEED

Volume and intricacy make it nearly impossible for human operators to unravel the deeply interwoven threads of activity on the blockchain. On the other hand, machine-scale analytics are ideally situated to meet that need, with the ability to drill down, organize the data, and present intelligible insights.

THE OPPORTUNITY

The use and trading of digital assets opens a unique aperture for federal regulators and law enforcement. With every piece of information coded, validated, and stored, it becomes possible to utilize analytic tools to ensure compliance and track potentially nefarious activity. As crypto's ease-of-use upends traditional financial processes, blockchain's transparency and permanence, along with its shared nature, create a window of opportunity for investigators to apply the power of analytics to follow activity down to the user level.

For regulators, analytics will build confidence in the system, ensuring that all participants in the digital assets ecosystem are operating in compliance with existing statutes. For investigators, analytics will be the primary tool to detect and prevent financial crime.

Data analytics generally refers to the use of mechanical processes and algorithmic approaches to make sense of complex information sets, drawing connections that might not be visible to the naked eye. When applied to a blockchain, analytics can, in effect, scrape the shared public record, cluster information and surface the connections between disparate crypto wallets. This makes it possible to identify anomalies, including potential criminal activity, while reducing risk for all participants in the system.

Analytic tools can segment out types of transactions on a blockchain. These tools can identify trends and bring into the open the relationships between the blockchain and other data sources. When applied in real-time, the analytics capabilities can potentially identify and flag payment fraud in transit, empowering responsible parties to freeze a suspicious transaction as it unfolds.

Tokenization illuminated

A key trend supported by a blockchain is "tokenization," the ability to create a digital marker representing a valuable piece of information, assigning it a unique identifier. While there is an anonymous quality to tokenized data, this doesn't mean that it is exempt from regulatory compliance.

Traditional encryption creates opacity: One cannot perform analytics on data in an encrypted or protected state. Tokenized data, on the other hand, retains its referential integrity and statistical distribution, meaning it is ripe for analysis. Blockchain analytics offers a means to peer behind the curtain, as the use of tokenized data continues to expand.

Blockchain analytics will leverage the familiar data analytic toolsets and expand upon these capabilities. In addition to the standard analytical tasks—preparing data, running algorithms, producing reports, and generating predictions—on-chain analytics will lean heavily on a technology known as a graph database.

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Raw blockchain data contains significant insight waiting to be explored.

Designed to illuminate relationships, a graph database offers a relationship representation of data rather than a mere document or table. This approach uses nodes to store data entities and defines "edges" to show where nodes intersect—the moment where Person A pays Person B, for example. For law enforcement, regulators, and others seeking to disentangle the complex web of blockchain interactions, the visualization of relationships offers a powerful capability.

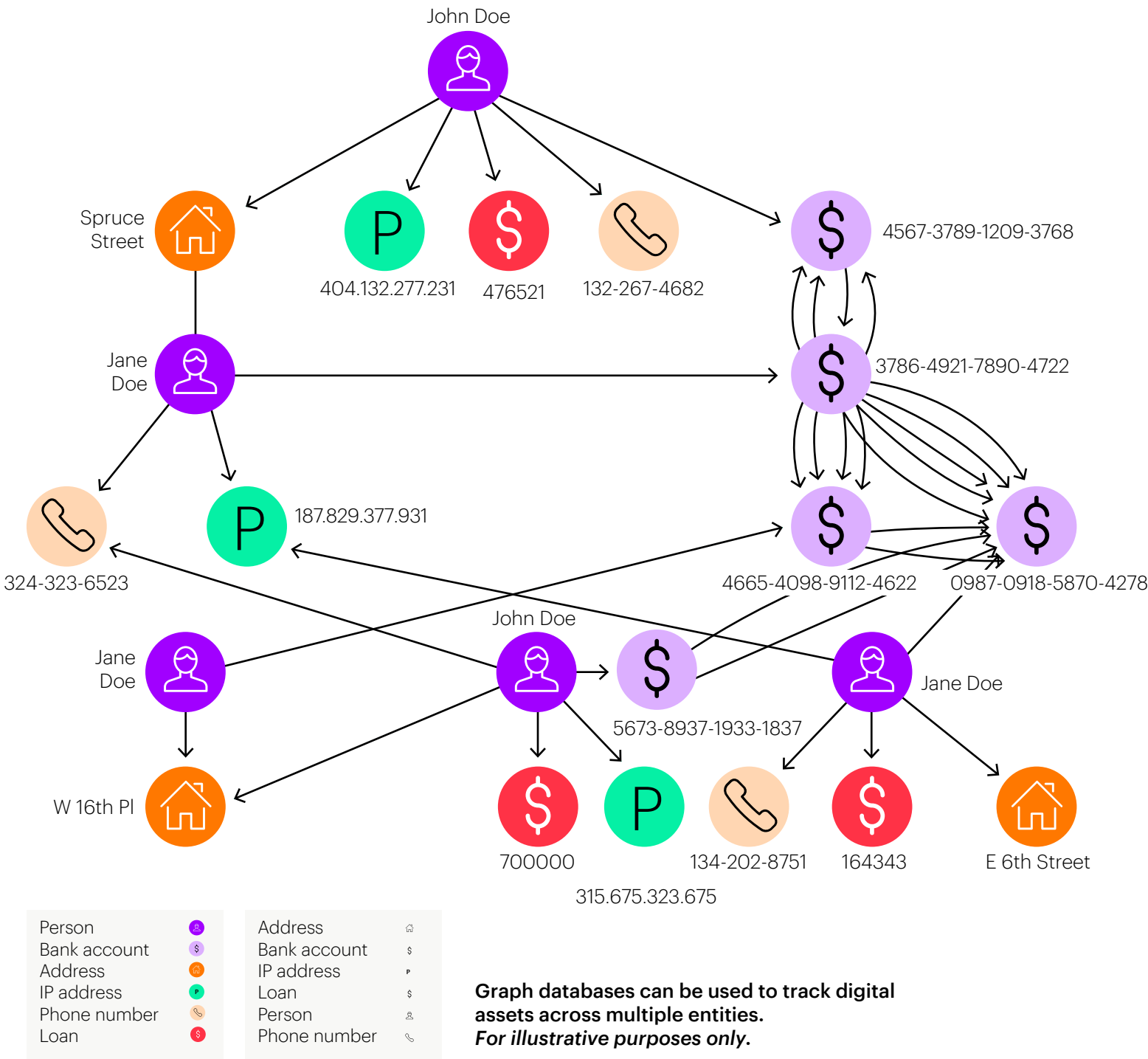The graph database makes it possible to literally "see" who is connected to whom and by what pathways.
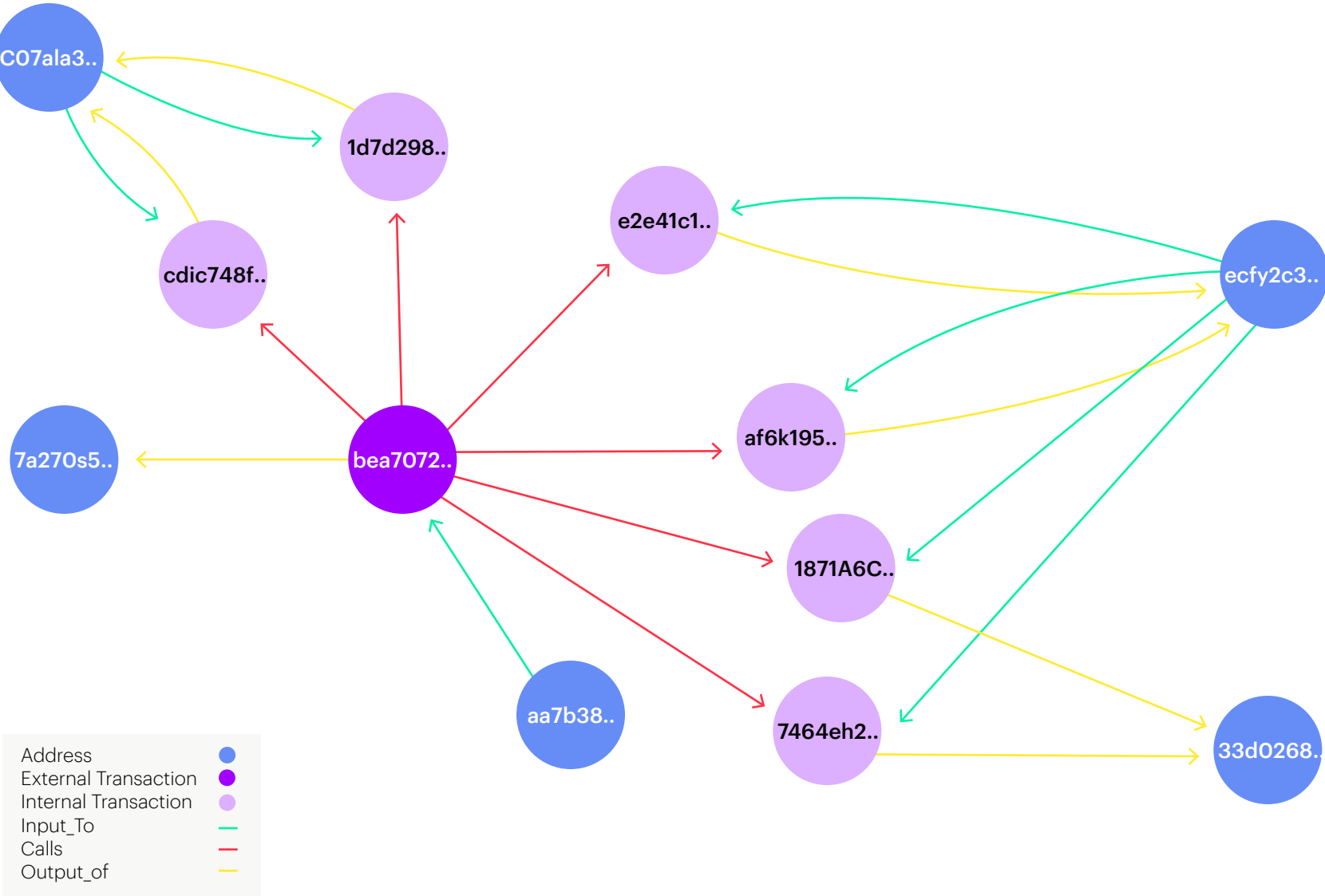
Deconstruction of DeFi transaction across smart contracts.
For illustrative purposes only.

Follow the (digital) money

Top use cases

Several key use cases demonstrate the potential power of blockchain analytics in the federal space. They may support missions such as marketplace monitoring, compliance enforcement, and targeted investigations.

Track and trace: Law enforcement and internal investigators are already familiar with a critical capability in data analytics: Link analysis. In the global war on terror, analysts faced an urgent need to connect the dots between key players, to know who was talking to whom, to gain clarity around the scope and activities of individuals who, while networked together, sought to keep their connections invisible to prying eyes.

Legend

Person		Address	
Bank account		Bank account	
Address		IP address	
IP address		Loan	
Phone number		Person	
Loan		Phone number	

Graph databases can be used to track digital assets across multiple entities.
For illustrative purposes only.

For bad actors to exploit digital assets for criminal purposes, they need to move assets between addresses or entities. Understanding how those nodes are connected represents the digital equivalent of the link analysis activities with which law enforcement and national defense are familiar with. Where counter-terror investigators used cell phone records, for example, to discover the ties between bad actors, blockchain analytics can scrutinize the activity of wallets, represented as nodes in the graph database, to achieve a similar outcome.

Anti-money laundering and fraud: These same techniques can elevate the impact of investigations around money laundering and fraud, both in support of compliance and crime-fighting. The digital version of link analysis makes it possible to see where and how the money flows in detail.

Analytics offer the ability to monitor transactions and detect suspicious patterns of activity. Because cryptocurrency is not truly anonymized but rather "pseudo-anonymous," analysts can use their ability to follow illicit funds to find not just bad actions but also bad actors. While criminals may use a range of tools to disguise their illegal activity—using non-compliant exchanges to move funds or running multiple wallets to cover their tracks—analytics can peer deeply into such activity to surface a clear picture for investigators.

Risk analysis & enforcement: The markets for digital assets are often highly volatile, potentially due to the lack of robust infrastructure, fragmented regulations, or perceived value. As the Financial Stability Board shared earlier this year, "crypto-asset markets are fast evolving and could reach a point where they represent a threat to global financial stability due to their scale, structural vulnerabilities and increasing interconnectedness with the traditional financial system."

A specific risk is these markets' widespread use of "smart contracts" for trading. Smart contracts use embedded algorithms to negotiate and execute transactions by verifying that preset conditions are met. These tools are powerful but not foolproof. For example, a hacker recently exploited a gap in a crypto fund managed by Indexed Finance to manipulate a trade costing the firm $16 million, raising important legal questions that are currently unresolved.

All of this creates the need for powerful analytics to monitor marketplace movements, identify and track participants, evaluate the fairness of transactions, and assess and manage risk. A particular focus is understanding the trading patterns associated with smart contracts, peering under the hood to track and enforce compliance with relevant requirements.

Compliance: Regulators and their enforcement agencies are tasked to ensure that digital asset transactions comply with all relevant financial rules and regulations. Analytics is a proven tool to ensure compliance.

Regulatory decision-makers need to understand the varied activities unfolding on a blockchain and how virtual money is shared to be effective. They need accurate insights into the economic activities of nations and individuals, and analytic tools such as the graph database offer that higher level of awareness.

Economic activity analysis: Regulators need a clear picture of economic activity at the macro level too. With more of that activity happening daily in virtual currency, blockchain analytics rises to the fore.

The Ukraine crisis illuminated the need for nations to be able to understand and evaluate the transfer of funds on a global scale. Along with their peers in the Defense Department and the Department of Justice, financial regulators have a vested interest in elevating their ability to parse out these global-scale economic trends. Visual analytic tools make it possible to see how money literally moves across the geographical map.

Specialized tools

While many major technology players have blockchain analytics offerings that expand on their existing data analytics toolsets, several niche players have arrived to stake their claims in this rapidly growing space. **A few examples:**

TRM enables continuous and automated transaction monitoring so users can quickly identify and react to fraud and risks. Behavioral analysis allows for the flagging of irregular transaction and activity patterns. TRM's Digital Asset Risk Assessments provide users with risk exposure calculations as well as real-time data visualizations for multiple blockchains.

Chainalysis supports financial compliance, identifying high-risk crypto activity and using a real-time API to halt suspect transactions, along with integrated case management to streamline compliance workflows. It provides profiles of 3,800+ crypto services, enabling monitoring and alerts of suspicious activity. Its investigative tools connect crypto transactions to real-world entities, while its blockchain intelligence offerings help transform on-chain data into actionable insights.

Messari's products include Messari Pro, which gives daily insights into sectors within the crypto-asset market for trading, compliance, or general knowledge use. Users can explore and visualize data such as trading, social, and development repositories from crypto-asset lists. Messari Enterprise allows businesses to continually monitor governance updates for the crypto assets they support to maintain timely compliance.

Lukka's analytic tools include Lukka Reference Data, which provides a comprehensive and standardized security master of crypto-asset names, tickers, trading pairs, and other trade information across 250+ sources and 34,000+ trading pairs. Lukka Prime provides a Fair Market Value pricing methodology for crypto assets to enable post-trade operations and reporting support.

Scaling up with blockchain analytics

Given the scale of transactions on the blockchain, combined with the rapidly accelerating adoption of digital assets, impacted agencies cannot afford to make blockchain analytics a bespoke tool available to only a handful of specialized individuals. They should be looking instead to implement analytics at scale.

Some are already seeking to achieve this by centralizing their efforts. They're establishing crypto hubs, digital asset labs, centers of excellence and even dedicated Offices to guide their actions. A center of excellence ensures all the needed talent is gathered in the right place and the agency's efforts are aligned across all its mission sets.

The center of excellence can also be the front door to interactions with industry players. Strong relations between agencies and industry will be essential as government looks to implement blockchain analytics at a meaningful scale. Vendors will have their finger on the pulse not only of the changing use cases—how both legitimate and illegitimate actors are putting digital currency into play—but also into emerging capabilities. Agencies can look to industry to support them with the best, most current tools as they seek to operationalize blockchain analytics on a scale needed to impact mission outcomes.

Much of the information agencies need is already out there: The public nature of blockchain means that anyone with an internet connection can participate. The right partner can help assemble the processes and tools needed to exploit accessible data to support specific agency-mission needs.

Getting started

For agencies looking to engage with blockchain analytics, it makes sense to begin with a deep dive into the specific information needs. By understanding the nature of the problem to be solved, they'll be able to make more informed decisions about the required tools and capabilities.

For example, if the aim is to track economic activity and know what's going on, routine data analysis capabilities may be sufficient for the task. If the mission set calls for a deeper dive and understanding of the interconnections between players on the blockchain, a more sophisticated tool such as a graph database may be required.

Agencies can also start to examine their policies concerning the uses of the blockchain, what is permissible, and in what context. To effectively apply analytics in the context of the mission, they'll want to ensure that policy (which for some has been evolving rapidly) is aligned with the intended uses of data.

There's a technology consideration in play as well. For example, an Ethereum archive node is over ten terabytes: It requires robust computing and a high degree of automation to discover patterns embedded within such a vast volume of information, ideally in real-time. Automation, in particular, will be critical not just to managing the workload but also to addressing the human limitations of IT teams that may already be overtasked and understaffed.

Blockchain represents a fundamental shift in the underpinnings of economic activity, and much is not yet known about how that shift's impacts will ripple across federal mission sets.

What's clear, though, is that analytic capabilities will play a key role in supporting federal agencies. Honed for use in the blockchain environment, data analytics tools can drive more profound insights, better decision making, and ultimately more effective action for those whose efforts are impacted by the rising adoption of digital assets.

Authors

Joshua Alderman
Finance & Fraud Analytics Lead
Accenture Federal Services

Liam Glennon
Digital Assets Lead
Accenture Federal Services

Rupal Lamorena
Managing Director & Financial
Regulatory Agency Account Lead
Accenture Federal Services

Alejandro Lira Volpi
Managing Director & Financial
Services Strategy Lead
Accenture Federal Services

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