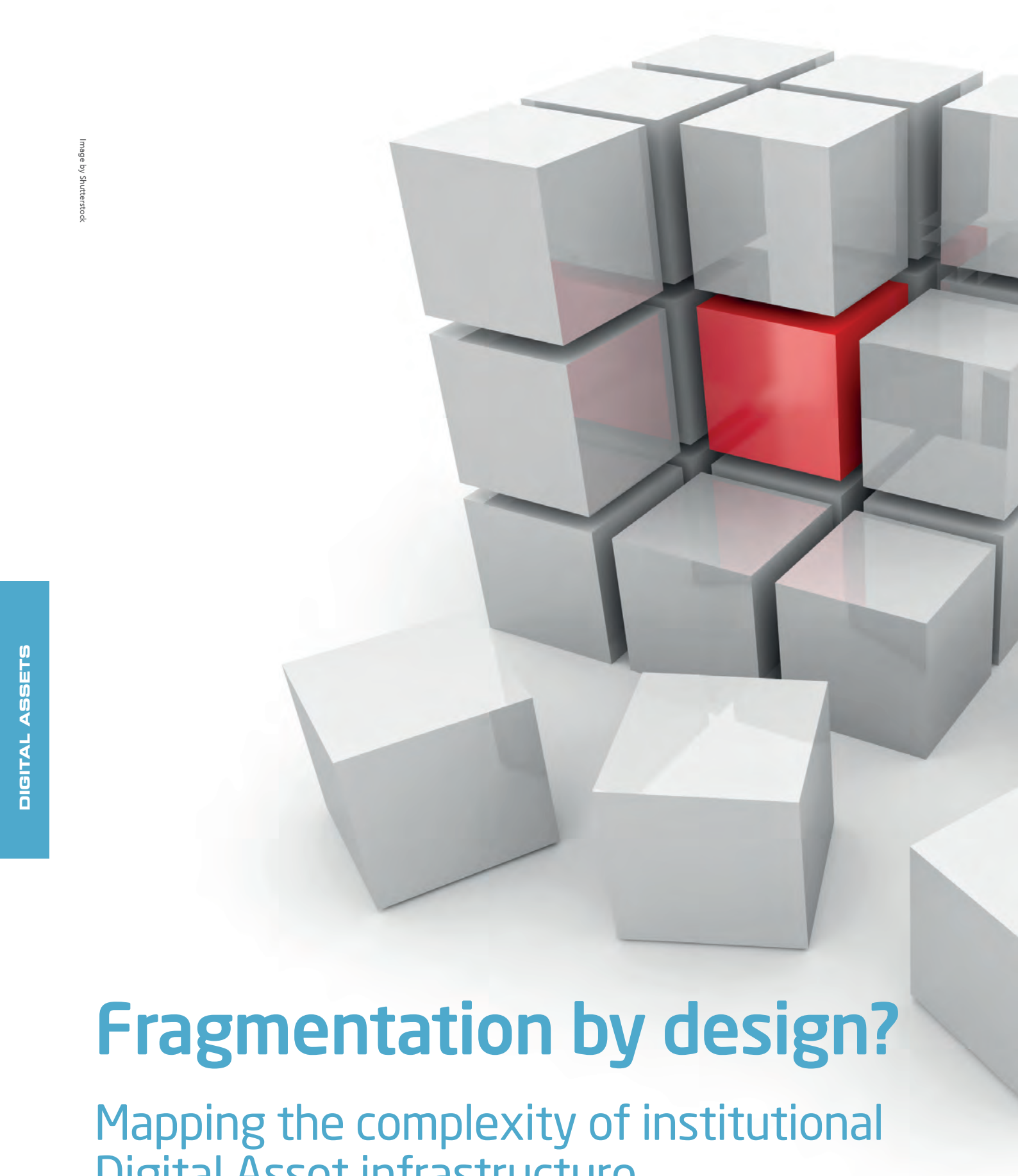

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Fragmentation by design?

Mapping the complexity of institutional Digital Asset infrastructure

The digital asset landscape remains stubbornly fragmented. As institutions enter the picture, fragmentation is posing significant hurdles, Vivek Shankar reports.

Vivek Shankar

In October 2025, Deutsche Börse Group announced a strategic partnership with Chainlink to publish its multi-asset market data on blockchain for the first time. This landmark move brings four billion daily data points from Eurex, Xetra, 360T, and Tradegate trading venues onto blockchain networks, signaling a dramatic shift in how traditional financial infrastructure is converging with digital asset markets.

This partnership emerges as institutional dominance in the digital asset space reaches new heights, with EY Parthenon reporting that institutional trading now accounts for more than 60% of all activity in digital assets.

But even as institutions deepen their engagement, with 85% increasing their allocations to digital assets in 2024 and a similar proportion planning further increases, they face a fundamental challenge: market fragmentation.

Unlike traditional financial markets that concentrate trading on a few dominant venues, the digital asset ecosystem remains highly fragmented, with liquidity scattered across dozens of exchanges without a single dominant platform. This fragmentation creates significant

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Steven Bartfield

hurdles for institutional participants seeking to build efficient, compliant, and risk-managed digital asset operations at scale.

As the crypto and digital assets market transitions from adolescence into early maturity, institutions can no longer wait for market infrastructure to naturally consolidate. Instead, they're grappling with complex connectivity challenges across custody, execution, settlement, risk, and compliance systems.

The question now is: how can institutions access an integrated infrastructure capable of navigating this fragmented landscape?

INSTITUTIONAL CHALLENGES AT THE FRAGMENTED FRONTIER

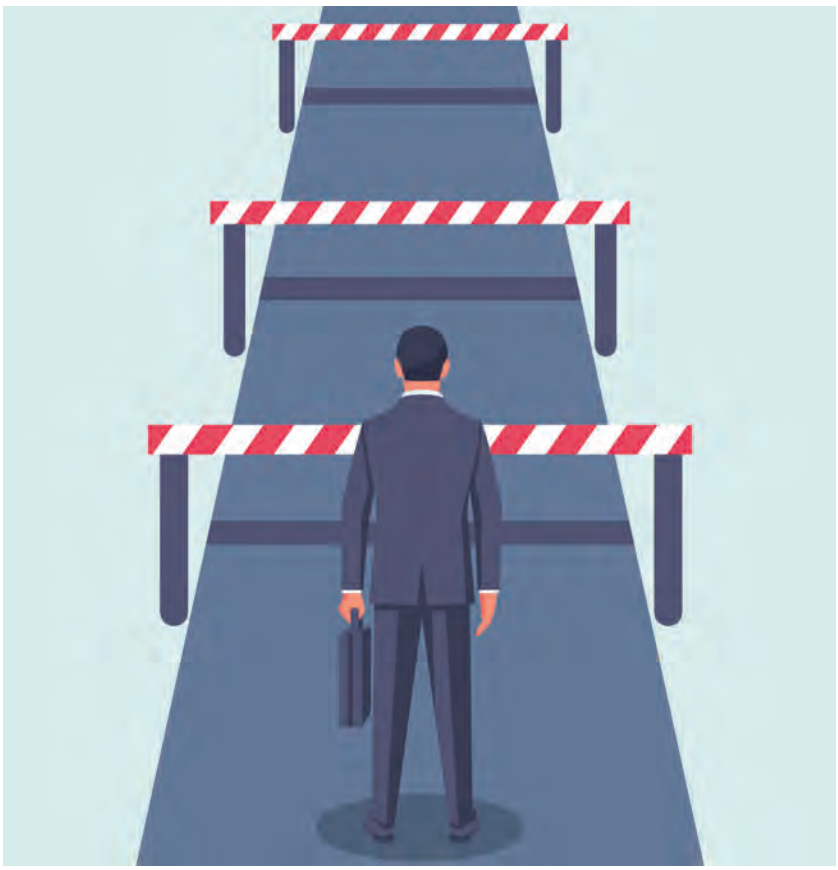
Digital asset markets present a radically different environment from the centralized, standardized infrastructure that institutional investors have grown accustomed to in traditional finance. As these markets continue to mature and attract more institutional participation, the fundamental challenges posed by fragmentation become increasingly apparent.

"Institutions thrive when liquidity is centralized, credit and settlement are standardized, and market access is uniform. Digital assets offer the opposite," explains Steven Bartfield, Chief Product Officer at BridgePort. "On the liquidity side, fragmentation is extreme. Price discovery is inconsistent, and large block trades are costly to execute. Market impact, slippage, and information leakage are the predictable results."

This dispersed liquidity landscape stands in stark contrast to traditional markets where established venues concentrate trading activity. Bartfield points out that traditional markets have built layers to address different trading needs: "exchanges for transparent flow, dark pools and OTC desks for blocks, retail venues for small orders." The digital asset ecosystem lacks this structured hierarchy, creating inefficiencies for large institutional players.

"Digital asset liquidity is spread across dozens of venues, each with different APIs, geographic bases, onboarding flows, and product offerings," notes Ethan Feldman, CTO and Co-Founder of Talos. This fragmentation "creates a heavy engineering burden for institutions that must integrate and normalize connectivity across WebSocket, REST, and FIX APIs, often without the benefit of standardized protocols or co-located infrastructure."

Beyond the technical challenges, fragmentation creates significant capital inefficiencies. As Bartfield explains, "On the capital side, prefunding drains balance sheets.



Fragmentation creates significant hurdles for institutional participants seeking to build efficient, compliant, and risk-managed digital asset operations at scale

"When custody, execution, treasury, settlement, and compliance sit in separate systems, every hand-off becomes a potential break.."

Ethan Feldman

Institutions must post collateral at multiple venues, an inefficient and risky model that echoes the pre-clearinghouse era of OTC markets, when firms juggled bilateral exposures and credit premiums at every counterparty."

The risks of this approach have been dramatically demonstrated in recent years, such as during the FTX collapse. In that case, asset fragmentation led to institutions absorbing losses. Insolvency proceedings involving Voyager and Celsius also highlighted the complexity of legal issues, specifically those around the allocation of customer rights to deposited assets.

Operational complexity extends beyond trading and settlement into custody and compliance. "For institutions, the core problem is not just fragmented liquidity but fragmented control. Custody sits in one system, execution in another, settlement in a third," Bartfield explains.This means institutions have to juggle with different rules, standards, and jurisdictional nuances. "The result is a patchwork never designed to function as a single control environment."

Feldman underscores this point: "When custody, execution, treasury, settlement, and compliance sit in separate systems, every hand-off becomes a potential break. Without an orchestration layer, institutions end up gluing systems together ad hoc, draining engineering time, slowing onboarding, and increasing the risk that systems disagree about what traded, what settled, or what's allowed."

This fragmentation creates two significant consequences, Bartfield says: "Risk visibility is broken. Credit checks happen venue by venue, reconciliations are manual and irregular, and there is no real-time golden book of record. Compliance costs explode. Every additional platform brings its own audits, reconciliations, risk controls, and filings."

The result is compounding costs. Feldman reiterates that orchestration is the best way to realize the vision of assets trading and settling in real time with minimal human intervention.

"Firms need orchestration to connect trading, reconciliation, settlement, reporting, and compliance into a single workflow," he says.

Bartfield concurs. "The real breakthrough will come from making many venues behave like one market from the perspective of credit, collateral, and settlement. If institutions can separate where they trade from where they carry risk, liquidity can remain distributed while balance sheets operate as if the market were centralized."

BUILDING THE TECHNICAL BRIDGE

While orchestration is an ideal solution, it doesn't come without challenges. Firms face complex technical infrastructure hurdles that extend from market connectivity to blockchain integration.
Market access and execution in the digital asset space demand sophisticated connectivity solutions tailored to specific institutional needs. And connectivity approaches vary significantly by firm type and trading strategy.

"Connectivity in digital assets will be shaped by operating models of the given market participant, just as it has been in every other asset class," explains Bartfield. "One theme is consistent: institutions are not trying to become technology companies. Their business is managing risk and generating returns, not building connectivity rails."

Most traditional asset managers care about integrating digital assets into existing workflows rather than rebuilding infrastructure from scratch. They typically maintain their Order Management Systems (OMS) for core operations while adding specialized execution tools for digital asset strategies.

"Success here means seamless best-execution and auditability without forcing the buyside to reinvent its stack," Bartfield says.

In contrast, systematic hedge funds and quantitative firms view connectivity as a potential source of alpha. They selectively build custom infrastructure that provides a competitive edge (in smart order routing, algorithmic trading, and data feeds), while outsourcing standardized components.
High-frequency trading firms and

Operational complexity extends beyond trading and settlement into custody and compliance

market makers take yet another approach, Bartfield says, often investing heavily in low-latency direct market access. However, he notes that "in digital assets it is still early. Fragmented liquidity makes it too costly to build low-latency infrastructure across dozens of exchanges."

The technical requirements for achieving best execution across this fragmented landscape are substantial. As Feldman explains, "Institutions must integrate with each exchange's supported protocols, including FIX, REST, and WebSocket, sometimes all three. Proper integrations cover not only market data and orders but also post-trade workflows, balances, positions, asset transfers, and exchange fees."

Traditional market protocols offer a starting point when assessing these complexities. Typical integration project procedures include launch protocols, stress testing, certification, and vendor coordination. A post-implementation review is generally required within six months of venue launch, according to regulatory guidelines in most mature markets.

For instance, European Securities and Markets Authority guidelines recommend real-time and periodic system reviews, with intensive monitoring around changes or new deployments.

Institutions can expect similar rules for digital assets, with the additional quirk that these integrations must account for the unique characteristics of digital asset markets.

"A smart order router must be fee, balance, and credit aware to avoid rejections and optimize execution," Feldman notes. Infrastructure resilience is equally important. "To overcome the instability and latency of internet-based trading, Talos is built for resilience with automated recovery, intelligent reconnection, and latency-aware routing that helps keep clients' orders trading through peak volatility."

Leading infrastructure providers are deploying sophisticated solutions to overcome these challenges, including colocating clients with liquidity providers, using direct institutional APIs, and optimizing cross-regional connectivity.

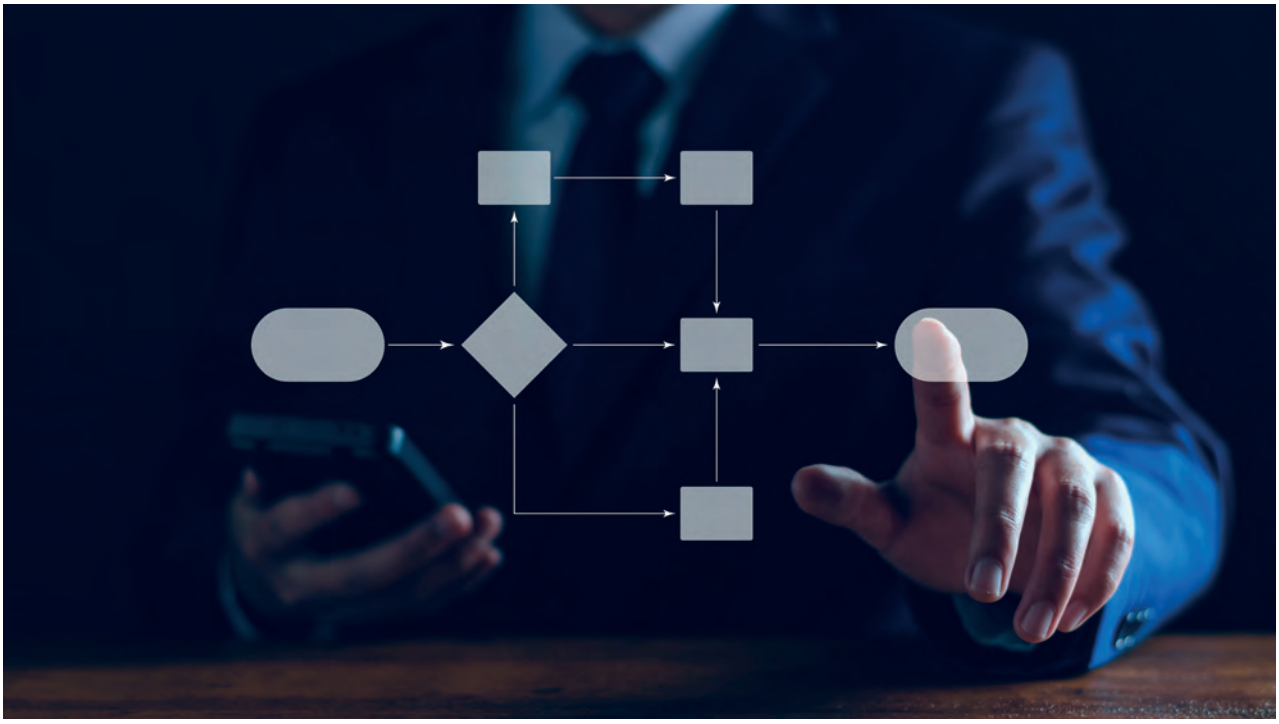
The goal is to provide "high-performance infrastructure that feels familiar to institutions while giving them unified access to CeFi, DeFi, and TradFi venues," according to Feldman. Beyond market connectivity, institutions must consider the complexities of blockchain integration. The landscape includes both base layer protocols (Layer 1) and scaling solutions (Layer 2), each with distinct characteristics and tradeoffs.

"Layer 1 systems like Bitcoin and Ethereum are the Fedwire or DTCC of digital assets, the base rails where final settlement occurs," Bartfield explains. "They are secure and definitive, but slow and expensive at scale." In contrast, "Layer 2 systems like Arbitrum or Lightning are closer to CLS in FX or netting in payments. They batch and compress activity before settling back to the base chain. That makes them faster and cheaper, but adds governance and operational risks, especially around bridges and interoperability."

Market data from OAK Research shows activity increasing in Layer 2 chains, potentially increasing the risks Bartfield mentions. DEX trading volumes on Layer 2 networks rose by 53.7% in October 2024, from $32.9 billion to $50.6 billion, with major gains from Base, Optimism, Arbitrum, and Scroll.

Optimism averages 990,000 transactions, while Base averages 7.5 million transactions per day. These figures are overtaking Layer 1 Ethereum in throughput, leveraging 2.5-second block times for rapid settlement.

Given these times, an institutional use case doesn't seem far-fetched. However, this raises the interoperability hurdle. Feldman explains the technical challenges.



Most traditional asset managers care about integrating digital assets into existing workflows rather than rebuilding infrastructure from scratch

"Direct integrations with Layer 1 and Layer 2 blockchains require running nodes or middleware, which can be costly and complex to operate, especially on high-throughput networks like Solana. For DeFi, while data is publicly available, pulling, indexing, and maintaining accurate blockchain data is error-prone and expensive."

These challenges are driving institutional adoption of specialized infrastructure providers rather than in-house development. "Running and maintaining infrastructure for every protocol or L2 can quickly become unsustainable," Feldman explains.

"The endgame is chain abstraction," Bartfield says. "Institutions will not manage nodes, bridges, or protocols directly. They will demand a single connectivity layer that makes L1 and L2 indistinguishable from the perspective of risk, settlement, and workflow."

This trend is evident in areas like DeFi trading, where specialized infrastructure is emerging, Feldman says. "Most custody and wallet providers are not built for high-frequency trading. DeFi trading requires dedicated wallets that are optimized for latency and bypass time-consuming security protocols like MPC, which are excellent for general custody but can add hundreds of milliseconds to a transaction."

As the market matures, Bartfield predicts that digital asset connectivity will fragment at the edge and consolidate at the core, much as it did with traditional asset classes. This consolidation creates opportunities for specialized infrastructure providers to build the connectivity rails that institutions themselves prefer not to develop.

THE AUTOMATION IMPERATIVE

For institutions engaging with digital assets, automation offers a fundamental shift in how capital can be deployed and managed. As trading volumes grow and operations become more complex, automated workflows become essential for maintaining efficiency, managing risk, and optimizing capital.

"For institutions, automation is not about convenience. It is the difference between trapped capital and balance sheet efficiency," explains Bartfield. "Automated credit checks and settlement release capital as soon as obligations are met, creating real-time mobility of assets and freeing firms to recycle collateral into new trades."

Recent estimates are not publicly available but previous studies by McKinsey and Ripple estimated that between $10-24 trillion is locked in prefunded accounts. While this number includes cross-border nostro and vostro accounts, it indicates the scale of the trapped capital problem. The impact of automation extends far beyond operational simplicity. In a market where prefunding requirements are common, automated processes enable institutions to maximize capital efficiency. This parallels developments in traditional markets, where automation transformed financial operations and economics.

Bartfield explains: "In repo and derivatives, automation changed balance sheet economics. Once margin calls and collateral transfers were automated, capital that had been locked for days could be reused several times in a single session. That velocity is what scaled those markets to trillions."

Feldman notes that the operational risks associated with manual processes are particularly acute in digital asset markets, underscoring the need for automation. "Manual interventions create operational risk, and even a one-cent break in settlement can cost thousands to manually reconcile," he explains.

Institutions need no introduction to crises caused by manual errors, of course. From opening gaps for fraud to causing monetary losses to creating reputational risk, errors caused by manual intervention rank higher than any risk caused by regulatory change.

The continuous nature of digital asset markets intensifies this. "In a 24/7 market with no downtime for manual checks, automation connects execution, reconciliation, and settlement into a single continuous workflow," Feldman points out.

These benefits extend across the investment lifecycle for both buy-side and sell-side participants. Feldman points out that "on the buy side, automation streamlines the full asset management cycle from portfolio rebalance through trading, reconciliation, and reporting. On the sell side, it enables real-time settlement with counterparties and liquidity providers, reducing settlement risk and freeing capital."

Achieving these benefits requires a strategic, incremental approach to building automated infrastructure. Bartfield cautions that institutions cannot expect a unified digital asset stack overnight. "The path is incremental: fix the biggest blockers first, automate the flows around them, and only then extend what already works."

The success of digital asset connectivity will depend on balancing innovation with stability, standardization with flexibility

So, what is an example of a big blocker? Bartfield points to centralizing credit and collateral management. "Prefunding is dead capital. Institutions will not scale with dead capital," he says. "Custodian-led, off-exchange settlement is emerging as the preferred model because it replaces bilateral exposures with a single set of credit limits, eligibility schedules, and settlement rules."

Once this is done, institutions can focus on automating key control workflows. "Every manual reconciliation is a potential compliance breach, and every slow collateral movement is trapped liquidity," Bartfield explains. "Automating credit checks, allocations, margining, and reporting frees balance sheets and restores confidence to the front office."

"No asset class ever scaled by building parallel pipes," Bartfield adds, underlining the importance of integration. "Digital assets must live inside the OMS, EMS, risk, and treasury systems that institutions already use. Consistent APIs, FIX connectivity, and a unified data model are the minimum standard." Feldman suggests that institutions should take a holistic view of the entire trade lifecycle. "It's critical that the infrastructure either supports all stages of the lifecycle natively or provides robust API integrations to seamlessly connect trading, settlement, and post-trade systems," he advises. "This avoids manual handovers that create operational risk and slow down processes."

The infrastructure supporting these automated workflows must also be purpose-built or modified for the unique characteristics of digital assets, he continues. After all, traditional systems might struggle with the unique demands of digital markets

FOR INSTITUTIONS ENGAGING WITH DIGITAL ASSETS, AUTOMATION OFFERS A FUNDAMENTAL SHIFT IN HOW CAPITAL CAN BE DEPLOYED AND MANAGED

and the precision required for high-frequency trading.

Rather than limiting options through exclusive relationships with single providers, Feldman feels orchestration offers a more practical (and lower risk) path.

"While some firms see using a single broker as a shortcut to reducing complexity, this often leads to higher long-term costs and limited flexibility," Feldman explains. "A better approach is an architecture where institutions retain choice across liquidity, custody, and counterparties."

Bartfield stresses that moving quickly is of the utmost importance. "The firms that industrialize these workflows first will be safer, faster, and more liquid, and they will define the pace at which digital assets scale."

These automated workflows represent "table stakes. Without them, traditional institutions will not participate at scale. With them, digital assets can finally absorb meaningful balance sheet commitment."

ARCHITECTING FUTURE DIGITAL ASSET OPERATIONS

Despite ongoing maturation in the digital asset market, fragmentation will remain a defining characteristic, Bartfield thinks. He points to mature markets (FX, equities, fixed income) where multiple venues coexist. "Some specialize in discretion and block trades, others in speed and transparency. Digital assets will follow the same path," he says.

This persistent fragmentation reflects fundamental market dynamics rather than immaturity. Different venues serve different purposes, and this diversity supports market innovation. However, the pattern changes when it comes to post-trade infrastructure.

"Beneath execution, the pattern flips," Bartfield notes. "Clearing, settlement, collateral management, and middleware consolidate because network effects are too strong."

This combination of fragmentation and consolidation aids further safe innovation.

Feldman extends this hybrid theme on the execution side. "Connectivity in digital assets is evolving toward a hybrid model that blends the best of cloud and colocation," he explains. "Cloud delivers global reach, resiliency, and 24/7 availability, while colocation provides deterministic low latency and physical cross-connects."

"Venues are moving to protocols like FIX and SBE for trading workflows," Feldman adds. "These protocols are not only more standardized and offer protocol-level solutions to failover and recovery, but also give better performance."

However, he points out that the advantage lies in combining low latency and stable infrastructure with a balanced mix of market makers and takers. This balance ensures that markets remain liquid and accessible to all participants.

Institutional choices with regard to service providers are more critical than ever

When asked what impact all this infrastructure consolidation is likely to have, Bartfield predicts that "a small number of neutral providers will dominate off-exchange settlement, credit intermediation, and workflow integration. Prime brokerage will likely consolidate around a handful of trusted players who connect clients to a fragmented execution landscape through a unified control layer." Recent events support this observation. Coinbase's acquisition of One River Digital Asset Management in 2023 and Borderless Capital's acquisition of CTF Capital in 2024 are two examples.

One result of this evolution is that institutional choices with regard to service providers are more critical than ever. Building solutions internally has a spotty record, at best. One reason is that connectivity is not an institution's core business. The secondary activities, such as maintenance and upgrades, that come with an infrastructure build tend to get sidelined.

The result is inefficient infrastructure that builds technical debt. Besides, Bartfield notes, there is ample precedent for buying solutions instead of building in the traditional markets."In FX, CLS scaled once the industry rallied behind it," he points out. "In clearing, DTCC became the backbone because it was neutral and purpose-built. Specialists innovate first, industry coalitions validate, and the infrastructure scales from there."

"Institutions selecting a digital asset connectivity and infrastructure provider should look for partners with deep experience in building and operating trading systems," Feldman adds. "Digital asset markets run 24/7 and carry high operational risk, so resilience, safety, and client service are critical." The ability to adapt to evolving market conditions is equally important, he points out. "As digital markets mature and new venues, assets, and regulations emerge, institutions need partners that have the resources and agility to adapt quickly, expand capabilities, and support new integrations," Feldman notes.

Ultimately, the success of digital asset connectivity will depend on balancing innovation with stability, standardization with flexibility. Digital assets may continue to remain fundamentally fragmented. But this does not imply that liquidity will follow the same route. With the right plan, unifying liquidity across venues is realistic.

It's also the best plan for resilience an institution can design.