DAMA 2:

Accelerated Asset Tokenization & Servicing for Regulated Institutions

A “Layer 1-2-3” solution

June 17, 2025

Deutsche Bank Memento AXELAR

Content

This paper was co-authored by Deutsche Bank, Memento Blockchain and Axelar Network developer Interop Labs.

1. Executive Summary

DAMA (Digital Asset Management Access) 2 is a blockchain Layer 1-2-3 platform that represents a leap forward in financial market operating models to solve critical digital-assets market entry and access challenges faced by asset and wealth managers. It is positioned to address shortcomings of current blockchain and traditional systems: DAMA 2 overcomes liquidity fragmentation, complexity and accessibility barriers while ensuring alignment with evolving regulatory frameworks.

Asset issuers would use DAMA 2 to access a comprehensive set of tokenization services to create and distribute tokenized funds, stablecoins and other real-world assets (RWAs), as well as asset servicing to support these instruments for asset safety and investor protection.

A Layer 2 Built for Asset Tokenization

DAMA 2 strategically combines Ethereum's robust, public-blockchain security foundation (as Layer 1) with Memento ZK Chain, a permissioned Layer 2 developed by Memento Blockchain using the ZKsync stack framework. This Layer 2 leverages Prividium (a technology that adds privacy to ZK Stack Validiums) architecture to provide scalability, speed and privacy capabilities, and hosts a smart-contract-based application marketplace (Layer 3) that simplifies the composition of blockchain-based financial services. The Memento ZK Chain was successfully deployed on the mainnet in May 2025 and deployment of new applications and use cases will be ongoing.

Multichain Connectivity

Interop Labs (initial developer of Axelar Network), a leading global blockchain interoperability expert, provides resilient connections to over 70 blockchains to facilitate distribution and other strategic possibilities. Developed collaboratively by Deutsche Bank, Memento Blockchain and Interop Labs, DAMA 2 incorporates advanced, multichain features including bridge management, modular compliance frameworks, on-chain investor registries and expense tracking mechanisms to support fund valuation and operational transparency.
Where necessary, on-chain transaction data will be digitally consolidated with traditional technology via standardized API plugs. DAMA 2 will feature an open architecture for custody wallets. AI-enhanced accessibility for issuers' time -to-market competitiveness is a planned roadmap milestone.

Access to a Generational Trend in Investing

Positioned in the estimated $84 trillion intergenerational wealth transfer trend[1] underway through 2045, DAMA 2 is a comprehensive competitive tokenization solution that offers industry issuers of digital assets and funds an intuitive user interface with one-stop access to create, program, launch, distribute and service their blockchain-based products. It is built to allow issuers and investment managers to ride the momentum of a generational shift in investing: millennials are more likely than baby boomers to own crypto and digital assets.[2] This next generation is digitally native, with a strong affinity for digital financial products and this creates a conducive environment to drive the emergence of tokenized financial instruments as a new asset class. The World Economic Forum[3] has identified asset tokenization as one of the most transformative forces in modern finance, with multiple possibilities to unlock deeper and newer benefits to investors and the industry.

[1] Press Release: Cerulli Anticipates $84 Trillion... | Cerulli Associates
https://www.cerulli.com/press-releases/cerulli-anticipates-84-trillion-in-wealth-transfers-through-2045

[2] New Research Finds Retail Investing Shift... | World Economic Forum
https://www.weforum.org/press/2025/03/new-research-finds-retail-investing-shift-towards-younger-investors-reshaping-market-trends

[3] How Tokenization Is Transforming Finance and Investment | World Economic Forum
https://www.weforum.org/stories/2024/12/tokenization-blockchain-assets-finance

What to Expect from this Lite Paper

DAMA 2 is targeted to be unveiled as an MVP in the second half of 2025. This is an interim update report to share insights and the direction that DAMA 2 is taking to converge with the future of digital finance.

In this report, we will:

- Update the problem statement that DAMA 2 seeks to solve by way of a summarized scenario analysis.
- Describe DAMA 2's Layer 1-2-3 architecture.
- Provide possible operating models including a 1:M distribution, composable compliance and directed order flows.[4]
- Cover DAMA 2 alignments with key safety and soundness goals as a regulatory-aware platform.

We hope this interim report provides useful insights and direction for all stakeholders interested in the future of digital finance.

[4] From Wallet to Chain: A Bridge... | Nethermind
https://www.nethermind.io/blog/from-wallet-to-chain-a-bridge-of-two-worlds-on-an-ethereum-transaction

2. Market Opportunity: The Tokenization Revolution

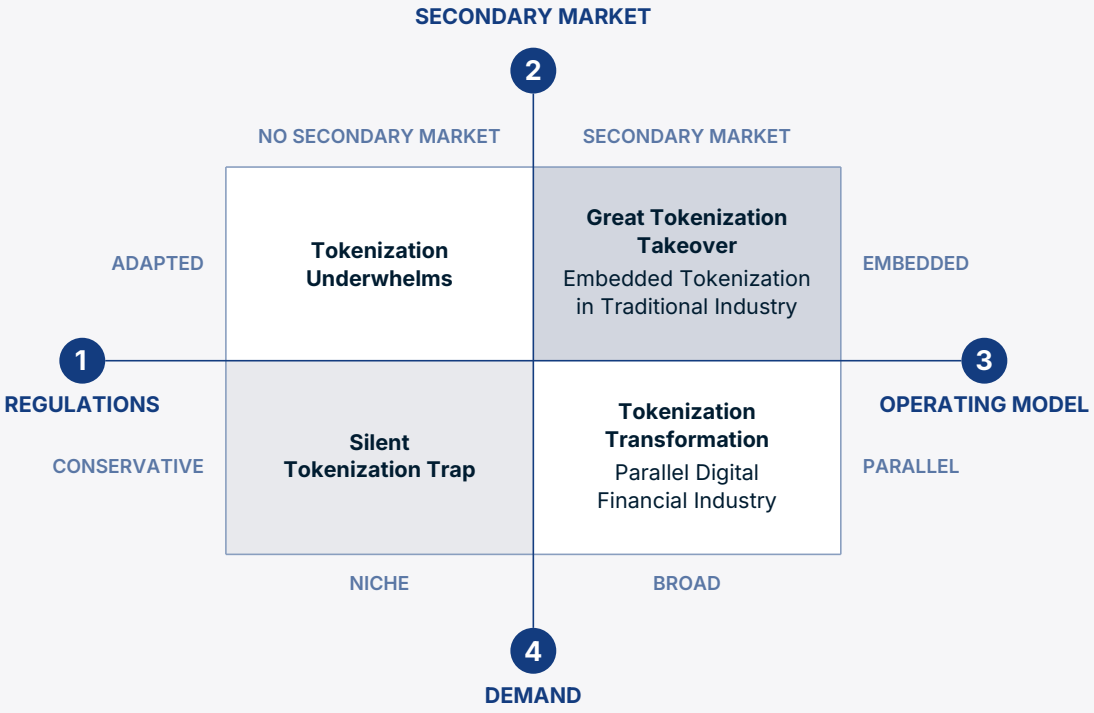
In 2024, global asset managers blazed new trails with tokenized money market funds and crypto ETFs, while benchmark bond issuers continued their blockchain-based issuances. Stablecoin adoption has increased and these assets are no longer viewed as unmanageable instruments of systemic risk. As a result, new operating models have emerged in parallel, led by collateral management with tokenized instruments. This momentum has continued strongly into 2025, with a restrictive US crypto environment thawing to introduce a wave of momentum for digital assets. Even so, the future of tokenization looks to be nearing a crossroads with two potential outcome scenarios. Current challenges include:

- Fragmented blockchain and technology landscape.
- Fragmented liquidity and product range with blockchains as islands, causing friction in access and limiting investor reach.
- Complex service provider integration with traditional providers unable to perform in the blockchain space and a variety of Web3 fintechs stepping in.
- Regulatory uncertainty around the use of available and cost-effective public chains versus private chains that can require significantly greater investments.
- Retail investor exclusions limiting tokenized products.

These and other challenges collectively result in long time-to-market, new costs and elevated operational complexity.

2.1 Plausible Future Tokenization Scenarios

Two poles of plausible future scenarios emerge from this cauldron of changing market behaviors.



2.1.1 Scenario 1 (Optimistic): The Great Tokenization Takeover

The Great Tokenization Takeover[5] is an optimistic scenario where tokenization becomes a cornerstone of global finance driven by a generational shift: wealth transfer and greater affinity towards digital assets. Supporting factors include: ease of access, broad adoption, conducive policy environments, thriving digital financial systems with secondary markets, interoperable systems that promote inclusiveness and participation, and new products offering attractive risk-adjusted returns for investors. In this scenario, tokenization redefines capital markets by merging traditional and digital into a combined new financial system where efficiency, accessibility and innovation thrive.

[5] Tokenization of Financial Markets | Baker McKenzie
https://www.bakermckenzie.com/en/insight/publications/2025/04/tokenization-financial-markets

2.1.2 Scenario 2 (Pessimistic): The Silent Tokenization Trap

The pessimistic scenario of *The Silent Tokenization Trap* sees progress stalling due to technological barriers, regulatory conservatism, multiple competing yet confusing standards to define what is good, high entry barriers, fragmented ecosystems, stagnation in primary and secondary markets, and a lack of products with superior risk-adjusted returns. In this case, tokenization becomes a peripheral novelty confined to niche use cases and crypto asset markets, without real transformative impacts on the financial industry.

2.1.3 DAMA 2: Infrastructure for Growing Tokenization

The DAMA 2 platform reimagines digital asset infrastructure to address a number of the above listed challenges to drive towards *The Great Tokenization Takeover*.

3. Tokenization Objectives & User Experience

3.1 User Objectives

This solution is designed for investment professionals, including asset managers and investment advisors, who are evaluating tokenized fund, stablecoin and RWA strategies with the following objectives:

1. **Expand product strategy and grow AUM:** Drive product innovation and tap into new distribution channels and investor segments.
2. **Bring tokenized assets to market quickly with minimal investment** in new hires and system builds.
3. **Retain operational flexibility:** Facilitate integration with preferred service providers and protocols without risks of vendor lock-in.
4. **Meet diverse end-investor requirements.**

3.2 Problem Statements:

1. **Shift from sequential to simultaneous lifecycle operations:**
Traditionally, an investment fund follows a linear lifecycle where issuance, distribution and servicing are carried out sequentially by distinct intermediaries. Tokenization compresses these stages into a parallel, multi-domain process where activities are concurrent and interdependent.

2. **Complex skillset landscape:**
To participate in this emerging model, investment professionals must navigate a diverse mix of capabilities—from smart contract design and coding to blockchain protocol and interoperability, regulatory compliance, and digital asset/fund servicing.

3. **Lack of cost-effective, institutional-standard, full-stack solutions:**
Comprehensive tokenized fund solutions that are able to meet the operational, compliance and security requirements of asset managers remain limited. Most offerings today are fragmented, costly to implement, and lack the robustness required for scalable, end-to-end adoption.

4. **Vendor sprawl and integration challenges:**
To resolve the above challenges, asset managers turn to a makeshift operating model that involves piecing together services from multiple niche, closed vendor systems. This, however, leads to the same vendor sprawl, disjointed workflows and legacy operational inefficiencies that tokenization seeks to alleviate in today's "spaghetti network" of intermediaries.

5. **New market complexities and risks:**
These technical and operational complexities not only inflate costs but also introduce additional cybersecurity, vendor and integration risks while diverting focus away from core investment responsibilities.

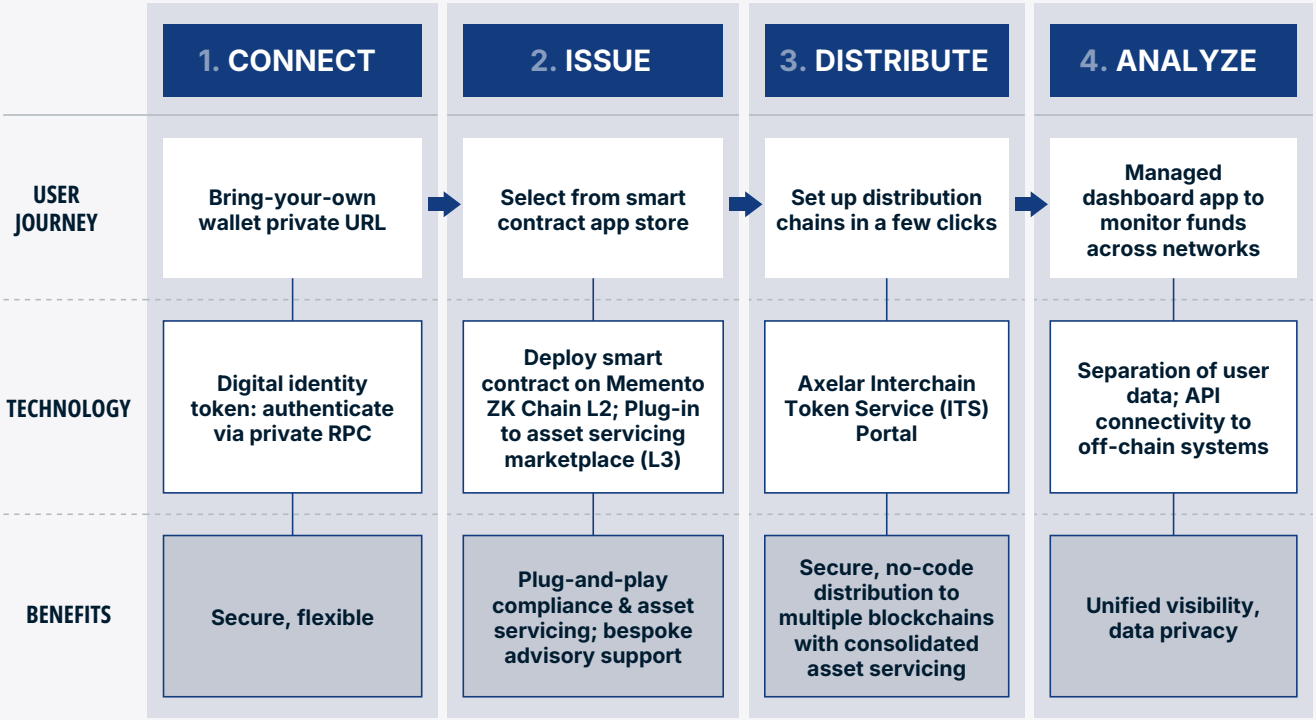
3.3 Solution: One-Stop, Open Architecture Orchestration Platform

DAMA 2 supports these objectives and addresses these problem statements via a modular Blockchain-as-a-Service operating model leveraging an open architecture that is inherently compliant and “technology-lite” by design.

KEY FEATURES	OBJECTIVES SUPPORTED	PROBLEM STATEMENT(S) ADDRESSED
One-Stop Blockchain-as-a-Service: Offers a comprehensive, risk-balanced and cost-efficient entry point into tokenized funds via a single platform.	Expand product strategy and grow AUM. Retain operational flexibility.	Shift from sequential to simultaneous lifecycle operations. Vendor sprawl and integration challenges.
Frictionless Access, Technology-Lite: Layer 3 hosts a smart contract app store to facilitate a user-friendly interface to access fund smart contract designs. DAMA 2 offers end-to-end fund orchestration; asset servicing support from DB Securities Services; advanced blockchain infrastructure from Memento Blockchain; and interoperability connectivity via Axelar Network for the 2025 MVP.	Bring tokenized funds, stablecoins and other RWAs to market quickly with minimal investment.	Navigating a complex skillset landscape.
Open Architecture: Bring-your-own-wallet supports choice of self- or third-party custody, offering the option to retain control over assets for trading or collateral purposes.	Meet variable end-investor requirements.	New market complexities and risks.

3.4 User Journey: Tokenized Fund Issuance, Distribution & Servicing

Project DAMA 2 delivers operational simplicity in a single, user-friendly front end that minimizes up-front investment and eliminates vendor lock-in.



4. Layer 1-2-3: Technical Capabilities to Market Differentiation

Building upon a user-centric design philosophy emphasizing ease of use by providing a one-stop window into the necessary service capabilities, DAMA 2's technical architecture serves as a technically powerful yet invisible engine that enables this frictionless experience for investment professionals entering asset tokenization with the objectives and problems that we have described.

This section describes DAMA 2's ground-breaking, three-layer approach that works in concert to deliver simplicity without compromising sophistication, resilience or precision—with regulated financial industry compliance standards integrated as part of its capabilities.

To facilitate ease of adoption and use, DAMA 2 will also deliver an interface that requires no specialized technical or blockchain knowledge; future improvements powered by AI will further improve the intuitiveness of this user experience.

4.1 Layer 3: The User Application Interface

Layer 3 is the application interface layer: asset managers and other token issuers interact at this layer with intuitive dashboards, ready access to a “smart contract factory app store” and simplified workflows that abstract away smart contract and blockchain technicalities. The following table lays out targeted features and capabilities of the DAMA 2 Layer 3.

FEATURE	WHAT IT DOES	WHY
User-friendly interface and smart contract factory app store	Create tokenized fund features with embedded asset servicing functionalities and token specifications.	Reduce investment in building blockchain technology teams. Plug-and-play, composable smart contract modules.
Digital identity token (soul-bound token)	Secure identity authentication token linked to wallets, whitelisting and remote compliance.	On-chain security and privacy, made simple and effective.
Paymaster function	Pay for gas on various blockchains using fiat alone.	Facilitate treasury management and minimize volatility exposure.
Managed privacy browser	An issuer will not be able to view another issuer’s smart contracts or transactions.	Transaction privacy on Layer 2.
Managed dashboard	Track investor holdings and transactions, on-chain fund expenses, on-chain stablecoin records and tokens frozen/burnt/in circulation across distribution chains.	Transparency, ease of monitoring and processing by consolidating asset tracking, investor entitlement records and inputs across distribution chains for off-chain NAV calculations.
Token holder distributions	Airdrop entitlement or digital information like corporate action notices into whitelisted wallets (B2B level).	Streamline distribution of investor entitlements.
Interchain Token Service	Deploy tokens and manage supply across multiple blockchains.	Secure, multichain availability with low developer overhead.

4.2 Layer 2: The Capabilities Platform

Layer 2 of the DAMA 2 stack (Memento ZK Chain) is based on a ZKsync framework, configured by Memento Blockchain and developed collaboratively to support an open architecture. It features a single (whitelisted) sequencer and serves as the layer where an asset issuer's digital assets and fund smart contracts are deployed.

Key features and benefits:

- **Choice of wallet and custody method:** Bring your own choice of wallets that will be whitelisted before token distribution.
- **Protocol flexibility:** Deploy any ERC/Solidity standard.
- **High scalability and throughput:** Supports up to 2,000 transactions per second and thousands of digital assets/funds smart contracts.
- **Near instant settlement finality:** Fast transaction confirmations to support legal certainty subject to agreement and legal reviews.
- **Hub-and-spoke interoperability:** Single access point to 70+ EVM and non-EVM blockchains for reach and resilience.
- **Managed on-chain transaction privacy:** Participants can only view their own transactions.
- **Off-chain data protection:** Confidential data is processed off-chain to preserve data privacy and ensure compliance.

4.2.1 Data Availability & Confidentiality

The Memento ZK Chain runs with *Prividium* (a Memento technology that adds privacy to ZK Stack Validiums), a specific design for regulated financial institutions that offers:

1. **Privacy:**

   Through chain configurations, enables permissions and access control, allowing only KYC/KYB-verified entities to operate. Additionally, with the use of private remote procedure call (RPC) and block explorer, it provides a fully packaged solution, delivering privacy and performance.

2. **Validium:**

   - A scaling solution that uses an off-chain data availability model, allowing institutions to choose where their data lives: on-premise, in secure cloud environments or in private off-chain storage, without compromising proof integrity.
   - Transaction data is stored off-chain, and verified to Layer 1 via zero-knowledge proofs.
   - Other confidential data such as personally identifiable information (PII) are also stored off-chain, with on-chain tokens bearing pointers to such off-chain information.

4.2.2 Managed Privacy

Managed privacy of on-chain transaction transparency occurs on Memento ZK Chain Layer 2. This privacy is achieved via specialized RPC endpoints that logically separate views between different users. The system can grant overview of all transactions to approved viewers—for example, a regulator—by means of procedural approvals. In this way, transaction privacy can be preserved on Layer 2.

Where tokens are interoperable between the DAMA Layer 2 and a destination public chain, subsequent transactions on that destination chain would leave this managed privacy environment.

Token, wallet, smart contract and network-level privacy capabilities are part of future roadmap and subject to regulatory approvals.

4.2.3 Hub-and-Spoke 1:M Interoperability

INTEROPERABILITY PROTOCOL COMPARISON

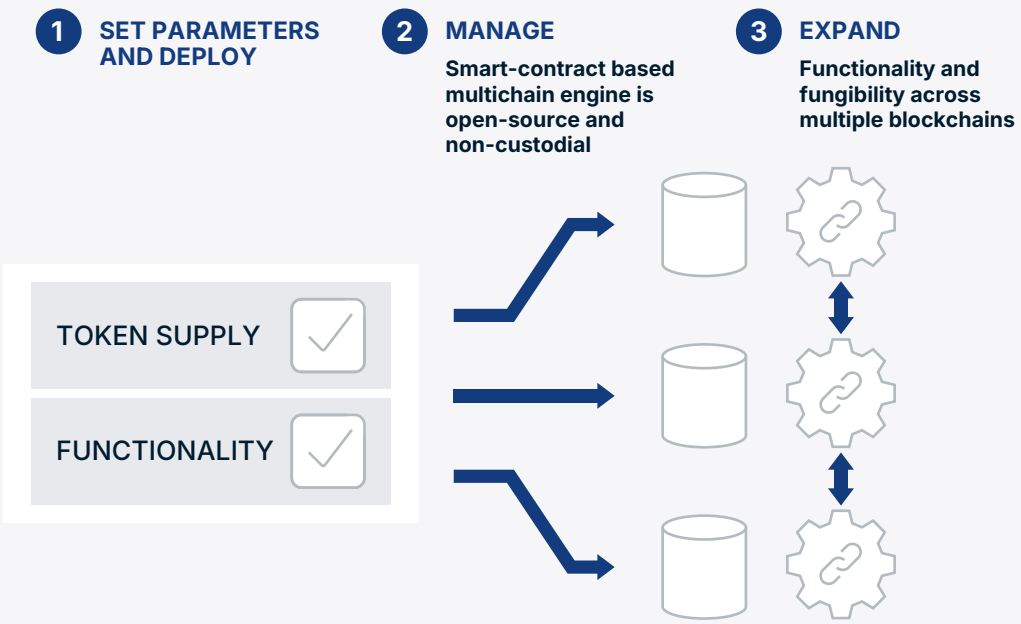
Axelar delivers secure interoperability at scale.

PROJECT	# CHAINS SUPPORTED	DECENTRALIZED & PERMISSIONLESS	# ACTIVE VALIDATORS	FULL-STACK INTEROPERABILITY?	CONNECTION DESIGN	PARTNERS	APPROVED BY UNISWAP
INTEROP PROTOCOL "A"	40	NO	70	NO	Point-to-Point	Aave, Synthetix, Swift, ANZ	
INTEROP PROTOCOL "B"	90+	NO	1–3*	NO	Point-to-Point	Radiant Capital, Ondo, Ethena	
INTEROP PROTOCOL "C"	35	NO	19	NO	Hub-and-Spoke	Uniswap, Lido, Pendle, Pyth, Circle	✓
AXELAR	77	YES	75+	YES (Incl. Relayers)	Hub-and-Spoke	dYdX, Lido, Ondo, Frax, Decentraland, JP Morgan, Deutsche Bank, Mastercard	✓

**Default for most connections.*

Layer 2 includes a gateway into the Axelar Network, connecting over 70 EVM and non-EVM blockchains. Key activities that occur on this Axelar Network plug-in include smart contracts containing updatable rules, supporting programmable compliance. Industry-level rules and requirements like blacklisted wallet addresses are posted in this rules contract for token contracts to use, maintained by the DAMA 2 operator. A minimum level of sanctions filtering and industry-level event management would be transparent to users.

4.2.4 Axelar Interchain Token Service (ITS) Portal



- Axelar's Interchain Token Service (ITS) Portal provides a single, no-code interface for distributing and managing tokens across multiple blockchains. ITS automatically translates and preserves fungibility and functionality across all selected blockchains.
- For each token/fund, ITS automatically deploys a Lock/Unlock Token Manager contract on the Layer 2 home chain, and corresponding Mint/Burn Token Manager contracts on each of the distribution chains.
- As an additional asset protection service, a third-party custodian like Deutsche Bank Securities Services can be appointed to manage the Token Manager Contracts that hold the capability to lock, unlock, freeze, burn and mint tokens across selected blockchains.

Interoperability with other Layer 2 blockchains is possible via native plugs and data can be offloaded into a JSON format for push/pull into existing off-chain systems.

4.2.5 Settlement Finality

Settlement finality—the point when a transaction cannot be reversed—is reached on DAMA 2 as described in the following table.

TRANSACTION TYPE	SETTLEMENT FINALITY
Transaction within Memento ZK ChainLayer 2	Once the transaction is initiated, Memento ZK Chain single sequencer provides immediate feedback on transaction acceptance. This point of transaction acceptance can be deemed the point of settlement finality in both technical and legal terms.
Batch of transactions originating on Memento ZK Chain Layer 2 and written to Ethereum Layer 1 as a recovery point objective (RPO)	Cryptographic finality is reached once the Verifier contract on Ethereum validates the committed zero-knowledge proof, confirming correct execution of the Layer 2 batch.
Transaction originating on Memento ZK Chain Layer 2 and distributed to 77+ EVM and non-EVM Layer 1 and Layer 2 public chains	Reached once the transaction is transferred cross-chain to Axelar's Token Manager, and the Token Manager has issued tokens on destination chains and sent them to user wallets.

4.3 Layer 1: The Security Foundation

As an added factor for user confidence and trust in transaction validity, DAMA's Layer 1-2-3 architecture is anchored to the Ethereum public blockchain as its foundational security layer. There are two main activities on Layer 1:

1. Proofs are submitted by the centralized sequencer on Memento ZK Chain to the Layer 1 verifier contract for consensus; and the Layer 1 functions as a recovery point objective (RPO) to facilitate public record integrity and recovery where required.

A proof consists of the components listed below. It does not contain any confidential data that would trigger privacy laws.

- **Pre-state root:** The state of the rollup before the batch transactions.
- **Post-state root:** The state after batch processing.
- **Batch root:** The Merkle root of all transactions in the batch.
- **Merkle proofs of transactions:** To demonstrate the validity and inclusion of each transaction in the batch.

The Layer 1 verifier contract then checks if the sequence of transactions represented by the proof rightly transitions the Memento ZK Chain from pre-state to post-state. This ensures the integrity of transactions within the Memento ZK Chain.

2. Gas on Ethereum is paid for validation (via a Paymaster function).

4.3.1 Attack on Ethereum Scenario

Attacks on the Ethereum Layer 1 consensus mechanism, while theoretically possible, face significant economic, technical, social and administrative barriers.[6] To successfully compromise today's Ethereum Proof-of-Stake consensus, an attacker would first need to control at least 33% of total staked ETH—about USD 29 billion in today's terms[7] —just to disrupt finality. To reorder transactions would require 51% of staked ETH, over USD 58 billion in value.

Once such an attack commences, Ethereum's defensive mechanism to slash the attacker's stake would kick in, causing not just financial losses for the attacker but also necessitating the attacker to draw on more financial resources to maintain its 33% position. It becomes a question of which will run out first—Ethereum's processing capacity to slash or the attacker's financial reserves.

Such an attack cannot be mounted suddenly, since there is an activation queue to become an Ethereum validator, due to limitations on the number of new validators to be admitted per epoch. Likely community response and coordinated social recovery mechanisms would act as another effective deterrent.

In the unlikely event of an attack on Ethereum as Layer 1, DAMA's Layer 2 would continue the following as normal:

- Transactions continue with immediate transfers between transaction participants and/or smart contracts.
- Technical settlement finality (no transaction reversal) is safeguarded by the single trusted sequencer.
- Legal terms and conditions add further administrative safeguards against unauthorized reversals, like traditional industry post-trade settlement agreements.
- Off-chain data is not impacted by the Layer 1 attack and is not at risk of being breached.

[6] Breaking BFT: Quantifying the Cost... | Lucas Nuzzi et al. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4727999

[7] Assuming ETH is USD2,600 and a 33% attack. Approx 34.7 million ETH is staked, with 32 ETH staked by each validator. 33% of 34.7 million is 11,451,000 ETH or ~USD29 billion; ~353,177 validator nodes. (Source: Validator Queue https://www.validatorqueue.com, last accessed on 16 Jun 2025.) This is a magnitude estimate of economic capital cost (before slashing penalties, indirect costs, etc.) being similar or greater after Ethereum's Pectra upgrade (May 2025).

The key impacts to Layer 2 are as follows:

- Proofs (as RPOs) are not written from Layer 2 to Layer 1 until Ethereum recovers and reverts the malicious blocks (after which the Memento ZK Chain can realign with the honest chain).
- Should Ethereum be irreversibly corrupted, the ZKsync Stack could be configured to use a different EVM-compatible Layer 1 chain.
- Axelar is built on a hub-and-spoke network topology that allows compromised blockchain connections to be quickly isolated until normal blockchain operation has been restored, limiting cross-chain contagion of security breaches.[8]

4.4 Layer 1-2-3 Capabilities Summary

To sum up this section on Layer 1-2-3 capabilities, DAMA 2 technical architecture directly enables:

- Ease of use with a familiar user application interface and smart contract factory app store that abstracts away technical complexities (Layer 3).
- Speed-to-market advantage with a one-stop platform delivering necessary service components.
- Layer 2 staging area for smart contract and issuance that allows explainable privacy.
- Breadth of distribution with cross-chain interoperability and composability to link liquidity, investors and products.
- High level of scalability and resilience.

The next section will briefly highlight DAMA 2 cost effectiveness, designed to ensure sustainable operations that enhance users' and the platform's competitiveness and longevity during uncertain economic cycles.

[8] How Axelar Keeps You Safe During Emergencies | Axelar
https://www.axelar.network/blog/hub-and-spoke-architecture

5. Cost Effectiveness for Competitiveness & Longevity

An optimized, flexible cost structure creates sustainable competitive advantages that competitors with poorly configured costs can struggle to match in pace, quality and innovation.

DAMA 2 seeks to provide asset and wealth manager pioneers in digital assets with such an enabling platform for their first-mover scale efficiency.

In our experience and observation, first forays into new markets can reap alpha returns. However, these opportunities must be balanced against uncertain demand, shortages of required expertise, and heightened need to manage financial and regulatory exposures. If not managed, these factors can quickly sink great ideas.

DAMA 2 design reflects this experience and understanding—for example: its adaptation and use of publicly available and battle-proven blockchain technologies; standard templates where possible to reduce development costs for new users; and customizable features to meet user's specific needs. DAMA 2 seeks to facilitate allocation of user resources from administration to innovation.

These goals have been backward propagated throughout design and execution. DAMA's Layer 1-2-3 structure is a purpose-built architecture employing leading yet mature blockchain technology that builds in degrees of future proofing to avoid unnecessary technical debt and upgrades that can be distracting. Its composable design allows selective upgrades and maintenance to minimize disruptions. Proprietary or private-chain endeavors—while enticing to build achievements from scratch—can require substantial upfront investment and necessitate higher ongoing operational costs that can translate into more expensive services for clients.

While blockchain-native costs are inherent, they are designed to be transparent and scalable. These include off-chain license fees to access the platform, on-chain transaction gas fees required for the sequencer to process blockchain activity and protocol level fees charged by applications operating on DAMA 2.

5.1 Private Chains & Platforms Vs. Blockchain-as-a-Service: Tradeoffs

The below table outlines some of the considerations, based on empirical observation, taken into account by DAMA 2 to build an economic moat for itself and its users.

OBJECTIVE	SINGLE ENTITY PRIVATE CHAINS & CONSORTIUM-LED PRIVATE PLATFORMS	BLOCKCHAIN-AS-A-SERVICE
BUILD PLATFORM & CAPABILITIES	Build, customizations and integrations self-developed by a single entity or group of entities. Typically involves building on a native private blockchain or forking a public chain to make it into a private variant.	Offered as a one-stop, compliance-by-design platform for tokenized fund management and servicing, composed using available capabilities.
STREAMLINE ACTIVITIES	Business activities are performed by participants. Technical operations, e.g., nodes and validators in-house or outsourced.	Deploy and distribute tokenized funds, stablecoins and RWAs onto multiple networks through a single window. Plug-and-play into ready-built asset servicing modules with option for additional customized build.
NETWORK EFFECTS	Siloed.	Open connections.
MINIMIZE COST	Requires upfront investments.	Low fixed and variable structure. Can be tiered for varying needs.
PRIVACY ASSURANCES	High within the confines of the system.	High within the confines of the system.
MINIMIZE ANTI-TRUST / FREE-RIDER CONCERNS	Elevated risk due to reliance on proprietary systems.	Lowered risk due to reliance on open-source and decentralized systems.
ENSURE REGULATORY COMPLIANCE	Full control of compliance parameters.	Full control of compliance parameters, with modular and composable elements.

5.1 Private Chains & Platforms Vs. Blockchain-as-a-Service: Tradeoffs (Cont'd)

OBJECTIVE	SINGLE ENTITY PRIVATE CHAINS & CONSORTIUM-LED PRIVATE PLATFORMS	BLOCKCHAIN-AS-A-SERVICE
MINIMIZE SPECIALIZED EXPERTISE REQUIREMENTS	Required expertise includes: I. Protocol developers. II. Smart contract developers. III. DevOps engineers. IV. Blockchain infrastructure engineers. V. Blockchain cybersecurity.	Reliance on public infrastructure enables execution by smaller teams.
PROTOCOL-BASED DEVELOPMENT	Requires the following configuration steps: I. Choose protocol stack: fork public chains or employ natively private networks. II. Choose consensus mechanism. III. Encode access and roles. IV. Develop base configurations—modify source code, define block time, gas fees, genesis block.	Configuration not required, plug-in only.
INFRASTRUCTURE SETUP & DEPLOYMENT	Requires the following development work: I. Deploy node clients. II. Set up networking: load balancers, P2P. III. Establish endpoints. IV. Hosting—on-prem, cloud or hybrid.	No setup and deployment development work required, plug-in only.
BLOCKCHAIN GOVERNANCE	Asset issuer must define roles and responsibilities.	Asset issuer must define: I. Roles and responsibilities. II. Voting power and mechanism. III. Whitelists to network, smart contracts, apps and tokens.
DEPLOY SMART CONTRACTS, APPLICATIONS	Required steps: I. Set up development environment. II. Import and deploy from open-source contract library or write and compile from scratch. III. Define/implement event logs. IV. Integrate with applications, e.g., wallets. V. Option to plug into ready-built apps, request additional build, and/or DIY.	Required steps: I. Define roles and responsibilities for smart contract/app management. II. Define whitelists to smart contracts, apps and tokens.

6. Overview of Regulatory & Safety Concerns & Risks

The DAMA 2 Layer 1-2-3 tokenization platform is specially designed to align with regulatory frameworks, as well as safety and soundness goals.

DAMA 2 achieves functional regulatory alignment through composition of technical innovations at Layer 1. For example:

- Separation of duties via a Proposer-Builder Separation system, which creates market-based checks and balances.
- Ethereum's economic security guarantees, where its validators stake substantial economic value that creates stronger "skin in the game" accountability than many traditional financial industry controls.
- Robustness and resilience by avoiding single points of failure.
- Layer 1 public blockchain traceability of gas payments.

Layer 2 acts as the permissioned layer with soul-bound tokens for verifiable on-chain identity tagged to wallets.

Axelar's security approach implements proof-of-stake consensus at its network core, the same battle-tested consensus mechanism used by most of the blockchains it connects, including Ethereum. Its diversified pool of 75 validators is the largest and longest-running in cross-chain. Validators secure underlying verification proofs and exercise governance over possibilities to appoint subsets of identifiable Verifiers for regulated financial work.

Atop this best-in-class security approach, Axelar defends against risk at the following layers:

- Definite sets of permissioned Verifiers for each connected system, customizable to specific requirements.
- Hub-and-spoke network topology that supports rapid mitigation and containment in the event a connected system is compromised.[9]
- Open-source codebase and public-blockchain recordkeeping, eliminating single points of failure.
- Audit trail[10] and incident-free track record longer than any other cross-chain network.

[9] How Axelar Keeps You Safe During Emergencies | Axelar
https://www.axelar.network/blog/hub-and-spoke-architecture

[10] Axelar Network Audits | Axelar
https://github.com/axelarnetwork/audits

6.1 DAMA 2 Technical Solutions & Functional Outcomes

The architecture has intentionally incorporated features that address key regulatory concerns[11-13] including the following:

REGULATORY CONCERN	DAMA 2 TECHNICAL SOLUTION	FUNCTIONAL OUTCOMES
Transaction reversal through consensus "51%" attacks	Battle-tested Ethereum public chain as Layer 1 cryptographic settlement layer. Proofs are written onto Ethereum as an RPO. Uses a Layer 2 blockchain that contains transaction records with a centralized sequencer as its expert steward. Forced inclusions via Layer 1 into Layer 2 are controlled by an access list.	Record integrity achieved through technical architecture, with minimal exposure of records to the Layer 1 public chain. Minimize the possibility of consensus attacks by relying on Ethereum. Attacks on Ethereum are a theoretical possibility today, with an estimated $29 billion needed just to disrupt finality (more to change transactions), excluding significant financial penalties.
Systemic risks due to obstruction of settlement finality	The point of settlement finality on Layer 2 is defined legally and takes precedence, e.g., on transfers.	Settlement finality achieved via legal agreements, technology choice and billions in economic guarantees (Layer 1).
Market abuse, e.g., MEV Frontrunning	No public mempools in Layer 2, preventing Maximum Extractable Value (MEV) attacks.	MEV attacks cannot occur on Layer 2 as it is a trusted, centralized single sequencer. Directed Order Flow allows asset managers to interact with private mempools on Ethereum for frontrunning protection.

[11] From Wallet to Chain: A Bridge... | Nethermind
https://www.nethermind.io/blog/from-wallet-to-chain-a-bridge-of-two-worlds-on-an-ethereum-transaction

[12] The Financial Stability Implications of Tokenisation | FSB
https://www.fsb.org/2024/10/the-financial-stability-implications-of-tokenisation

[13] Novel Risks, Mitigants and Uncertainties... | BIS
https://www.bis.org/bcbs/publ/wp44.pdf

6.1 DAMA 2 Technical Solutions & Functional Outcomes (Cont'd)

REGULATORY CONCERN	DAMA 2 TECHNICAL SOLUTION	FUNCTIONAL OUTCOMES
Transaction privacy	Layer 2 transactions are validated by a trusted, centralized single sequencer. Specialized RPC endpoints enable logical separation of transactions visible to each user, while retaining the ability for "super users" like regulators to view all transactions. Zero-knowledge proofs for a batch of transactions are submitted to Layer 1 without revealing details of each transaction. Confidential data such as personally identifiable information (PII) are stored off-chain, with on-chain tokens bearing pointers to the off-chain information.	Privacy of Layer 2 transactions is preserved through customized user entry points, access controls and logical separation of data visible to each user, and shielded from Layer 1 validators using cryptographic techniques.
Validator technology risk management	Layer 2 is operated and secured by a trusted, centralized single sequencer and would satisfy this requirement. Direct interactions with Layer 1 can be routed via Directed Order Flow to whitelisted, known builders, relayers and proposers. Axelar's best-in-class validator security includes quadratic voting and periodic validator key rotations.	Cybersecurity risk management achieved via either identification/due diligence or large pool size of validators to ensure robustness.

6.1 DAMA 2 Technical Solutions & Functional Outcomes (Cont'd)

REGULATORY CONCERN	DAMA 2 TECHNICAL SOLUTION	FUNCTIONAL OUTCOMES
Zero-day vulnerability defenses	Layer 2 is operated by a trusted, centralized single sequencer and would manage its speed of response via agreed SLA and best practice standards. Layer 1 Ethereum is built to foster validator diversity: there is no single validator software. Axelar connectivity delivers layered risk management: hub-and-spoke mitigation, custom Verifier sets, open-source code, permissionless validator set.	Layer 2 speed of fix driven by SLA and best practices. Decentralized and diverse validator sets avoid single points of failure and prioritize liveness.
Gas payments to undesirable validators	Layer 2 uses a trusted, centralized sequencer. Layer 1 gas payments are traceable. Through directed order flows, gas payments can be made to known validators. Axelar connectivity can be secured by a defined set of permissioned Verifiers—with underlying governance and verification proofs secured by a decentralized set of 75 validators.	Sanctions compliance and Counter-Terrorist Financing (CTF) achieved via technological means.

7. Conclusion

DAMA 2 seeks to accelerate asset managers, wealth managers and issuers' adoption of digital assets and digital funds as arguably the first-ever comprehensive, available, interoperable tokenization platform built with regulatory alignment as a core design principle.

Please follow us for the latest updates:

Deutsche Bank

- https://linkedin.com/company/deutsche-bank
- https://db.com

Memento

- https://linkedin.com/company/memento-blockchain
- https://x.com/Memento_Bc
- https://mementoblockchain.com

AXELAR

- https://axelar.network
- https://x.com/axelar
- https://linkedin.com/company/axelarnetwork
- https://discord.gg/axelar