Canton-Anchored Reference Architecture for Tokenized Deposit and RWA-ABL Integration:

On-Ramp/Off-Ramp Design for Receivables, Inventory, and Private Credit Finance

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Abstract

Tokenized deposits and tokenized real-world asset (RWA) asset-backed lending (ABL) have advanced along largely independent technical and regulatory tracks despite forming complementary halves of a single capital-flow architecture. This paper argues that the on-ramp/off-ramp boundary between fiat-denominated deposit rails and on-chain collateralized credit is the binding architectural constraint on capital efficiency, settlement risk, and reconciliation overhead in tokenized small and medium-sized enterprise (SME) finance. It develops a Canton-anchored reference architecture that treats sub-transaction privacy, synchronization domains, and the Daml authorization model as first-class primitives, and addresses the cross-chain boundary explicitly through three patterns: messaging-protocol bridges (LayerZero, Chainlink CCIP, Wormhole), custody bridges, and native dual-issuance. The architecture is layered into settlement, asset, identity, orchestration, off-chain integration, and cross-chain boundary tiers, each analyzed through transaction cost economics, two-sided platform theory, network economics of standardization, and privacy as an economic primitive. An illustrative model compares Canton-primary, EVM-based, and hybrid configurations across SME accounts receivable, inventory and equipment ABL, and private credit fund interests, producing scenario-based, indicative 50–80% reductions in total cost-per-dollar-financed for the headline A/R use case under stated assumptions. The paper is decision-oriented for banks, non-bank lenders, SME borrowers, and policymakers, and identifies regulatory anchors across the FDIC, SEC, BIS, Basel, FSB, and MiCAR frameworks. Canton-specific empirical data remain thinner than EVM data; the model is illustrative rather than empirical.

Keywords: tokenized deposits; real-world assets; asset-based lending; Canton Network; Daml; cross-chain interoperability; private credit; SME finance; reference architecture; transaction cost economics

JEL Codes: G21, G23, G32, O33, K22

1. Introduction

The financing of small and medium-sized enterprises (SMEs) and middle-market firms remains one of the most persistent failures of modern capital markets. The International Finance Corporation and SME Finance Forum estimate the global micro-, small- and medium-enterprise finance gap at roughly USD 5.7 trillion, with the gap widening rather than closing in recent years [1]. The World Trade Organization places the global trade-finance shortfall in the same order of magnitude, with SMEs accounting for an outsized share of rejected applications even where overall demand is concentrated among larger firms [2]. Roughly 95% of firms worldwide are SMEs, yet the credit infrastructure that serves them has not kept pace either with their importance or with the digital substrate on which the rest of the financial system increasingly runs.

Two technological currents are now reshaping the rails on which SME and middle-market credit could plausibly travel. The first is the emergence of *tokenized deposits*: bank-issued, deposit-token instruments such as JPMorgan's JPM Coin (JPMD), HSBC's Tokenized Deposit Service (TDS), Lloyds Banking Group's tokenized sterling deposits, Citi Token Services, and the UK Finance "Great British Tokenised Deposits" (GBTD) consortium spanning Barclays, HSBC, Lloyds, NatWest, Nationwide, and Santander [3, 4, 5, 6]. These instruments preserve the legal character of bank deposits — they remain bank liabilities and sit on the issuing bank's balance sheet, and operate within existing prudential supervision [7]. Where a tokenized deposit satisfies the legal definition of a deposit and remains a liability of an insured depository institution, it may receive the same deposit-insurance treatment as the underlying deposit, subject to jurisdiction-specific rules and account-ownership limits. These instruments embed programmability, atomic settlement, 24/7 availability, and machine-readable composition with other on-chain instruments. The second is the rapid maturation of *tokenized RWA-ABL*: protocols such as Centrifuge, Maple Finance, Goldfinch, Provenance/Figure, and Ondo Finance, which originate or repackage receivables, inventory finance, equipment ABL, private credit fund interests, and tokenized U.S. Treasuries on public blockchains [8, 9]. Active on-chain private credit reportedly exceeds USD 18 billion as of late 2025 to early 2026, with cumulative originations above USD 33 billion [10]. Tokenized U.S. Treasuries collectively exceed USD 12 billion across BlackRock BUIDL, Ondo OUSG/USDY, Franklin Templeton, and Hashnote products.

Yet these two halves of what is functionally a single capital-flow architecture have evolved along largely independent tracks. Tokenized deposits live overwhelmingly inside permissioned bank infrastructure or on Canton, with cautious bridges to public chains; tokenized RWA-ABL lives overwhelmingly on Ethereum and its rollups, with stablecoins as the de facto cash leg. The result is a *binding architectural constraint at the on-ramp/off-ramp boundary*: the moment a credit

facility sourced from on-chain pools must settle into a borrower's bank deposit, or a receivable financed in fiat must be wrapped into a tokenized asset class, the system loses the very atomicity, programmability, and reconciliation efficiency that motivated tokenization in the first place. Capital is locked across the boundary. Settlement is delayed by stablecoin off-ramp queues, banking cut-off times, and chain finality differences. Reconciliation reverts to manual or batch processes between custody bridges, paying agents, and core-banking ledgers. The economic primitive on which atomic delivery-versus-payment depends — the simultaneous transfer of cash and asset — is broken precisely where it would matter most: at the interface between regulated bank money and tokenized credit.

The thesis of this paper is that this boundary, rather than any individual chain, instrument, or regulation, is the binding architectural constraint on capital efficiency, settlement risk, and reconciliation overhead in tokenized SME and middle-market finance, and that designing it well is the main outstanding engineering and economic problem. The paper develops a Canton-anchored reference architecture in response. It treats Canton's privacy-preserving sub-transaction model, synchronization domains, and Daml-based authorization semantics as first-class architectural primitives, and explicitly addresses the cross-chain boundary to non-Canton rails. The Canton choice is not arbitrary: as of mid-2026 the Canton Network reports more than 600 institutional participants and over USD 6 trillion in tokenized assets and recordkeeping value across Broadridge's Distributed Ledger Repo (DLR), DTCC, and other applications, with a pipeline of major institutional deployments — JPMD on Canton, DTCC tokenized U.S. Treasuries under SEC no-action relief, HSBC TDS, Lloyds tokenized sterling deposits, Northern Trust custody, and Ctrl Alt — analyzed in §6.1. DTCC and Euroclear co-chair the Canton Foundation, providing institutional governance anchoring [11].

On present evidence, these developments suggest an institutional adoption inflection point rather than a speculative bet, although production-scale evidence remains uneven across use cases. Canton is therefore among the strongest institutional candidates for anchoring a reference architecture that aspires to be both grounded in deployed infrastructure and practically usable for SME-scale credit flows. At the same time, sober treatment requires acknowledging that Canton-specific *empirical* data on settlement latency, fees, and reconciliation overhead remain thinner than EVM data, and the simulation in §7 is therefore framed as an illustrative quantitative model rather than an empirical study.

This paper makes four contributions. First, it articulates the on-ramp/off-ramp boundary as the binding architectural primitive, rather than treating it as a residual integration concern. Second, it offers a layered Canton-anchored reference architecture (settlement, asset, identity, orchestration,

off-chain integration, cross-chain boundary) usable as a design template for receivables, inventory, equipment ABL, private credit fund interests, and trade finance. Third, it presents an illustrative quantitative comparison of Canton-primary, EVM-based, and hybrid configurations across these use cases, with explicit assumptions and sensitivity analysis. Fourth, it positions the architecture against current institutional Canton deployments and non-Canton RWA-ABL platforms, drawing decision-relevant conclusions for banks, non-bank lenders, SME borrowers, and policymakers.

The remainder of the paper proceeds as follows. Section 2 reviews three streams of literature and positions the paper's contribution, including in relation to the author's prior work. Section 3 presents the theoretical framework. Section 4 dissects Canton's architectural substrate. Section 5 develops the layered reference architecture. Section 6 analyzes comparative cases. Section 7 presents the illustrative quantitative model. Section 8 addresses the cross-chain boundary in depth. Section 9 derives implications and recommendations. Sections 10 and 11 cover limitations and conclusions.

2. Background and Literature

The paper's contribution sits at the intersection of three streams of literature, none of which alone captures the on-ramp/off-ramp problem the paper takes as its object.

2.1 Tokenized deposits and wholesale settlement

The first stream concerns tokenized deposits and wholesale digital settlement. The Bank for International Settlements has played the central role in framing the conceptual distinction between *stablecoins*, which are bearer-style claims on private issuers backed by reserves that may include money-market fund assets, and *tokenized deposits*, which are non-transferable liabilities of regulated banks settled against tokenized central-bank money [7]. The "singleness of money" framing — that a dollar at any bank is interchangeable with a dollar at any other bank — is preserved under the tokenized-deposit model precisely because settlement still occurs through central-bank money, whereas private bearer tokens may fragment the unit of account [7]. The Brookings Institution and U.S. policy literature have reinforced this distinction in the U.S. context, particularly after the GENIUS Act formalized federal stablecoin treatment in mid-2025 and the FDIC's April 2026 proposed rule clarified that tokenized deposits satisfying the statutory deposit definition are treated identically to traditional deposits under the Federal Deposit Insurance Act [6, 12]. The European Union's Markets in Crypto-Assets Regulation (MiCAR), fully applicable since 30 December 2024, similarly carves bank-issued tokenized deposits out of the stablecoin

perimeter and routes them through the Capital Requirements Directive regime, while regulating asset-referenced tokens (ARTs) and e-money tokens (EMTs) separately [13, 14].

Empirical and applied studies have begun to document the operational characteristics of tokenized deposit deployments: Citi Token Services on permissioned infrastructure with 24/7 USD clearing; JPM Coin on Kinexys (cumulatively above USD 1.5 trillion in transaction volume since 2019, with daily volumes around USD 2–3 billion) and its planned native deployment on Canton; HSBC TDS spanning USD, GBP, EUR, HKD, and SGD across Hong Kong, Singapore, Luxembourg, the United Kingdom, and now the United States; and BIS Project Agora's seven-central-bank, 40+ private-institution effort to integrate tokenized commercial bank deposits with tokenized wholesale central-bank money on a unified ledger [5, 15, 16]. The author's own prior work develops the regional-bank case for tokenized deposit and stablecoin interoperability [17] and explores the broader question of where in the regulatory and use-case landscape different blockchain architectures — permissioned, consortium, hybrid, and public — are appropriate [18].

2.2 Tokenized RWA and on-chain ABL

The second stream is the rapidly growing literature on tokenized real-world assets and on-chain ABL. Practitioner data from RWA.xyz, DefiLlama, and protocol disclosures suggests that as of early 2026 tokenized private credit has crossed USD 18–20 billion in active on-chain exposure, with cumulative origination above USD 33 billion [10, 19]. The largest single concentration is Figure Technologies' tokenization of home-equity lines of credit on the Provenance Blockchain (with Figure Markets accounting for roughly USD 15 billion of the USD 20 billion active loan total according to RWA.xyz), followed by the Centrifuge–Maple–Goldfinch cluster (collectively roughly USD 3.2–4 billion in originations across SME working capital, fintech receivables, and emerging-market lending), and dedicated tokenized money-market and Treasury vehicles such as BlackRock BUIDL, Ondo OUSG and USDY, and Franklin OnChain [20, 21]. Centrifuge has supplemented its core lending pools with a Whitelabel tokenization service and a regulated tokenized S&P 500 product on Base [9].

The economic logic that this literature most consistently identifies is twofold: tokenization substitutes programmable, observable, and auditable cash-flow plumbing for the manual reconciliation workflows that dominate ABL today, and it embeds private-credit cash flows in liquidity venues with continuous secondary pricing, in contrast to the periodic redemption windows of business-development companies and unlisted private-credit funds. The April 2026 episode in which Blackstone's USD 82 billion BCRED fund faced USD 3.7 billion in quarterly redemption requests and tightened gating to 7% has been read in industry commentary as a

structural validation of token-layer liquidity for at least the senior tranches of comparable on-chain pools [20], though such commentary is necessarily speculative about future stress events.

This stream remains largely silent, however, on how the *cash leg* of these on-chain credit facilities should be designed when settlement quality, finality, and bank-grade prudential treatment matter. Stablecoins are the dominant cash leg today, but they may be less suitable for material institutional flows where deposit-quality settlement, prudential treatment, or bank-balance-sheet integration is required, and MiCAR and the U.S. GENIUS Act tighten this constraint further. The author's prior work on cross-chain tokenized credit [22] frames this directly as a design-space tension; the present paper extends that argument by anchoring it specifically in Canton.

2.3 Privacy-preserving institutional DLT

The third stream is the comparative analysis of privacy-preserving institutional distributed-ledger technology (DLT). Pre-2023 work focused largely on Hyperledger Fabric, Quorum, R3 Corda, and zero-knowledge rollups as candidate institutional substrates, with consortium permissioning and channels providing privacy at the cost of network effects. The Canton Network — purpose-built around the Daml smart-contract language and a sub-transaction privacy model in which each participant sees only the views of a transaction relevant to it — represents a distinctive evolution: Canton offers public, permissionless connectivity through a Global Synchronizer, but with disclosure scoped at the level of each Daml *view* rather than the entire transaction [23, 24]. Sub-transaction privacy and the synchronization-domain (formerly "Global Synchronizer") topology are the two architectural primitives that distinguish Canton both from public EVM chains, where transactions are visible by default, and from earlier permissioned ledgers, where privacy is a property of the ledger boundary rather than of the contract.

Comparative work on institutional adoption has accelerated since the December 2025 announcement that DTCC selected Canton for tokenization of DTC-custodied U.S. Treasury securities under an SEC no-action letter, and that DTCC and Euroclear would co-chair the Canton Foundation [11, 25, 26]. Broadridge's Distributed Ledger Repo (DLR) processes approximately USD 200 billion in daily repo volume — close to USD 4 trillion per month — on Canton infrastructure [27, 28].

Despite this institutional traction, very little of the literature treats Canton as the *anchor* of an integrated tokenized-deposit and RWA-ABL architecture for SME-scale flows; most analyses either describe Canton's institutional uses individually or treat it as a secondary destination for assets primarily issued elsewhere. The author's prior work on DLT and economic resilience [29] and on regulatory practices in emerging markets [30] provides background on the institutional and

regulatory implications of permissioned DLT but does not address the specific Canton-anchored ABL design problem this paper takes up. Likewise, the author's work on explainable AI in financial services [31] and on AI agents on blockchain infrastructure [32] intersects this paper at the orchestration layer (where AI agents may eventually manage collateral lifecycle decisions) and is identified in §10 as the natural follow-on.

The contribution of the present paper is therefore to integrate these three streams around the on-ramp/off-ramp boundary problem, anchor the resulting architecture in Canton, and make explicit both the within-Canton design choices and the cross-chain boundary design choices that determine capital efficiency and risk for SME-scale ABL.

3. Theoretical Framework

The reference architecture this paper develops is grounded in four interlocking theoretical lenses. None is novel in isolation; the contribution lies in their joint application to the on-ramp/off-ramp boundary in tokenized credit.

3.1 Transaction cost economics and cross-rail settlement

The first lens is transaction cost economics (TCE). Williamson's [33] treatment of the firm as a governance structure for managing transaction-specific assets and opportunism has been generalized by Davidson, De Filippi, and Potts [34], [35] into an institutional theory of blockchain. Catalini and Gans [36], [37] further specify the mechanism, identifying two costs that blockchain technology compresses: the cost of *verification* of state transitions and the cost of *networking* — the cost of bootstrapping and operating coordination in a market without ceding control to a centralized intermediary.

Applied to cross-rail settlement in tokenized credit, the TCE lens immediately identifies the on-ramp/off-ramp boundary as the locus where these compression gains are at greatest risk of being undone. Within a single rail, atomic delivery-versus-payment between a tokenized receivable and a tokenized deposit can substitute machine verification for a chain of correspondent confirmations, tri-party agent reconciliations, and agency-paying intermediaries. Across rails, however, the bridge introduces a new verification problem (did the wrapped asset actually represent a locked source-chain asset?), a new opportunism problem (validators or relayers may collude or be compromised, as the Ronin and Wormhole exploits demonstrated), and a new networking problem (who pays to operate the bridge, under what governance, and with what slashing?). The architectural question is therefore not whether to tokenize but whether to design the cash leg and the asset leg to share a

rail (eliminating the bridge problem) or to span rails (and pay the verification, opportunism, and networking costs explicitly).

3.2 Two-sided platform theory

The second lens is the theory of two-sided platforms. Rochet and Tirole [38], [39] showed that platforms intermediating two distinct user groups with cross-side externalities — payment networks being the canonical example — face a pricing structure rather than merely a price level, and that the optimal structure typically subsidizes the side whose participation generates greater externality on the other. A tokenized-deposit-and-RWA-ABL platform is straightforwardly two-sided: liquidity providers (banks, money-market funds, private-credit funds) are the cash side; borrowers and issuers (SMEs, originators, sponsors) are the asset side. Network externalities flow in both directions but asymmetrically: more issuers generate greater pool diversification and originator competition, which raises lender willingness to pay; more lenders compress the cost of capital, which raises borrower willingness to participate. A pricing structure that sets fees too high on either side risks the chicken-and-egg failure that has constrained earlier tokenization platforms.

The Canton Coin tokenomic design — fees denominated in USD but paid in Canton Coin, with all fees burned and minting tied to validator, super-validator, and application provider activity, with the application-provider share rising over time from roughly 15% to 62% as the network matures [40, 41] — is essentially a two-sided platform pricing mechanism in which application providers (and through them, end-users) are progressively subsidized to overcome cold-start problems.

3.3 Network economics of standardization

The third lens is the network economics of standardization. David's [42] treatment of QWERTY and Arthur's [43] formal model of competing technologies under increasing returns demonstrated that early adoption choices can lock in standards independent of their intrinsic technical superiority. Tokenized credit is currently in precisely such a moment. Token standards (ERC-20, ERC-3643, ERC-7540 for asynchronous tokenized vaults, the Canton Network Token Standard, the LayerZero OFT standard), messaging protocols (LayerZero, Wormhole, CCIP, Axelar, IBC, Hyperlane), settlement domains, and identity standards are competing for the institutional adoption that will lock them in [18]. The Canton institutional cluster (DTCC, JPMorgan, HSBC, Lloyds, Northern Trust, Broadridge, Goldman Sachs) and the EVM RWA cluster (BlackRock, Franklin Templeton, Ondo, Centrifuge, Maple) are the two most plausible candidate standard-setting blocs. Whether they converge or diverge will shape the cost and feasibility of cross-rail credit for at least a decade.

3.4 Privacy and disclosure scoping as economic primitives

The fourth lens, more novel in application, treats *privacy and disclosure scoping* as economic primitives in their own right. In a public-by-default ledger such as Ethereum, exposing positions, counterparties, and pricing imposes information rents on observers — sophisticated traders can front-run liquidations, competitors can infer pricing of bespoke facilities, and regulators receive less than they could because participants minimize on-chain exposure. Bank-grade ABL workflows simply cannot operate under such conditions. Canton's sub-transaction privacy model — in which each Daml view is encrypted to its informees and witnesses, with the synchronization domain seeing only ordered ciphertexts — converts privacy from an off-chain constraint into a programmable, fine-grained design parameter. From an economic standpoint, this means that privacy can be priced and negotiated as a feature of contract design, rather than being either fully present (by default in permissioned ledgers) or fully absent (by default in public ledgers). In the language of incomplete contracts, the visibility of state becomes a contractible parameter, which expands the feasible set of agreements.

These four lenses jointly motivate the architecture in §5: TCE explains why the on-ramp/off-ramp boundary is the binding constraint; two-sided platform theory explains why pricing and subsidy structure determine adoption; network economics explains why early standard choices have outsized long-run consequences; and privacy-as-primitive explains why the substrate must let participants choose what to disclose to whom.

4. The Canton Architectural Substrate

This section describes the four Canton primitives that the reference architecture treats as load-bearing for tokenized ABL: sub-transaction privacy, synchronization domains, the Daml authorization model, and the validator/super-validator topology.

4.1 Sub-transaction privacy

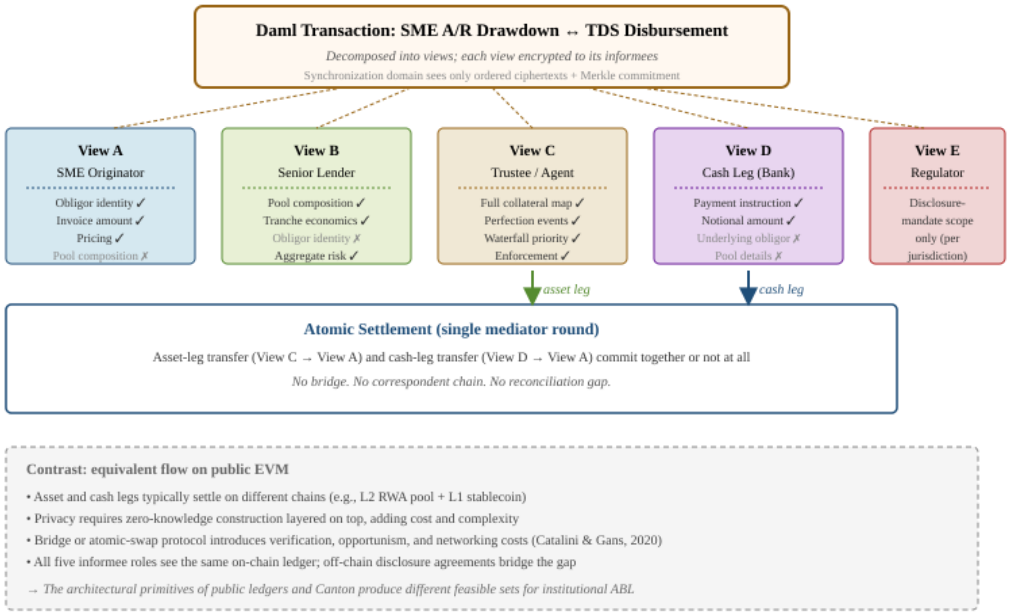
A Canton transaction is a tree of Daml *actions* (creates, exercises, archives) on contract instances. Each action has a set of *informees* (parties entitled to know that the action occurred and to see its arguments) determined by the Daml model itself — typically the signatories, controllers, and observers of the affected contracts. The submitting participant decomposes the transaction into *views*, where each view corresponds to a maximal subtree all of whose actions share the same set of informees, and encrypts each view to its informees using a symmetric key derived through a hierarchical key-derivation function from a per-transaction seed [23]. The synchronization domain

receives only ordered ciphertexts and a Merkle commitment over the views; participants receive only the views to which they are an informee.

For ABL, this primitive is decisive. A receivables-financing transaction can simultaneously involve the SME originator (which sees the obligor identity, invoice details, and pricing), the senior lender (which sees pool composition and tranche economics but not individual obligor identity), the junior tranche holder (which sees aggregated risk metrics), the trustee/agent (which sees full collateral mapping for enforcement), the regulator (which sees what the regulatory disclosure mandate requires), and the cash-leg counterparty (which sees the payment leg only). A single Daml model can encode this entire disclosure lattice and Canton will enforce it cryptographically. There is no equivalent in public EVM execution short of layered zero-knowledge constructions, which add substantial cost and complexity. Figure 1 illustrates this disclosure-and-settlement pattern.

Figure 1

Atomic DvP with sub-transaction privacy: a single Daml transaction decomposed into role-scoped views.



Note. Each informee receives only the views to which the Daml model entitles it, encrypted to that informee's keys; the synchronization domain sees only ordered ciphertexts and a Merkle commitment over views. The asset leg and cash leg commit atomically within a single mediator round. The contrast panel summarizes how the equivalent flow on a public EVM ledger differs in privacy, settlement, and reconciliation. SME = small or medium-sized enterprise; A/R = accounts receivable; TDS = tokenized deposit service; DvP = delivery-versus-payment.

4.2 Synchronization domains

A Canton synchronization domain (formerly *Global Synchronizer*) is a logical service that provides three functions: total ordering of transaction requests within the domain; transaction confirmation by an aggregating *mediator* that collects participant confirmations and finalizes commits; and topology management for admitting and revoking participants and keys [44]. Sync domains can be operated by a single trusted entity, by a consortium of operators using BFT consensus, or by an open set such as the Canton Network's public Global Synchronizer secured by Super Validators using two-thirds-majority Byzantine fault-tolerant consensus.

A Canton participant can connect to multiple sync domains simultaneously, and contracts can be transferred between domains through an explicit assignment/unassignment protocol. This composability is what allows a single architectural pattern to span private bank ledgers, consortium ABL ledgers, and the public Global Synchronizer. A bank can keep deposit-token issuance on a private domain while exposing transferable wrappers to a consortium domain for ABL settlement, all while preserving the same Daml model and authorization semantics.

4.3 Daml authorization model

Daml's authorization model is signatory-based: a contract has signatories whose authorization is required for create and exercise actions, controllers who can exercise specific choices, and observers whose visibility is contract-scoped. The Daml engine deterministically validates that every action in a transaction is authorized by the appropriate signatories, and Canton's confirmation protocol ensures that the participants hosting those signatories actually consent. Importantly, authorization is *intrinsic* to the contract definition — a tokenized receivable can be defined such that transfer requires both originator and trustee signatures, and no participant or domain operator can override that requirement.

For ABL, this means that perfection-style legal constructs — tri-party control agreements, springing security interests, waterfall priorities — can be encoded into the contract logic and enforced by the protocol rather than by paper agreements that require courts for enforcement. Combined with sub-transaction privacy, this allows the disclosure lattice and the authorization lattice to be co-designed.

4.4 Validator / super-validator topology and Canton Coin

Canton distinguishes three roles. *Participant nodes* (validators) host parties and process transactions on their behalf, retaining only the data those parties are entitled to see. *Super Validators* operate the public Global Synchronizer, validating Canton Coin transfers under BFT consensus and operating the Canton Name Service and supporting infrastructure. *Application*

providers deploy Daml applications and earn application rewards based on the activity their applications drive. As of early 2026, the Super Validator set numbers approximately forty active participants, with a CIP-0105 governance change requiring 70% of lifetime Canton Coin rewards to be locked for Tier-1 status [41, 45].

Canton Coin tokenomics use a burn-and-mint equilibrium with USD-denominated fees paid in CC and burned, and minting allocated by reward type and weighted by application activity. Total target circulation over the first decade is approximately 100 billion CC, with annual minting and burning roughly balanced around 2.5–10 billion CC (depending on protocol parameters and governance). This is, as §3 emphasized, a two-sided platform pricing mechanism: it subsidizes infrastructure providers heavily at launch, then progressively shifts toward applications, which is exactly the cold-start pattern Rochet and Tirole's framework prescribes.

4.5 Why these primitives matter for ABL

Together these primitives provide what tokenized ABL has lacked. Sub-transaction privacy lets borrowers, lenders, agents, and regulators each see only what their role requires, which is essential for SME credit where obligor identities and pricing are competitively sensitive. Synchronization domains allow private bank rails (where deposit tokens are issued) and consortium ABL rails to share a contract model and cryptographic settlement guarantees without forcing all data onto a single public ledger. Daml authorization lets perfection, waterfall, and control agreements be encoded into contracts. The validator topology preserves institutional accountability while allowing public-style composition. None of these is unique to Canton in concept, but their joint implementation in a network with documented institutional adoption is, at present, distinctive.

5. Reference Architecture

The reference architecture is layered into six tiers, summarized in Table 1. Each layer is described in terms of its primitives, the design-space tensions it encodes, and its on-ramp/off-ramp implications. The architecture is presented as Canton-primary — meaning that as much of the asset and settlement state as possible lives on Canton — with explicit hooks for cross-chain extension.

Table 1

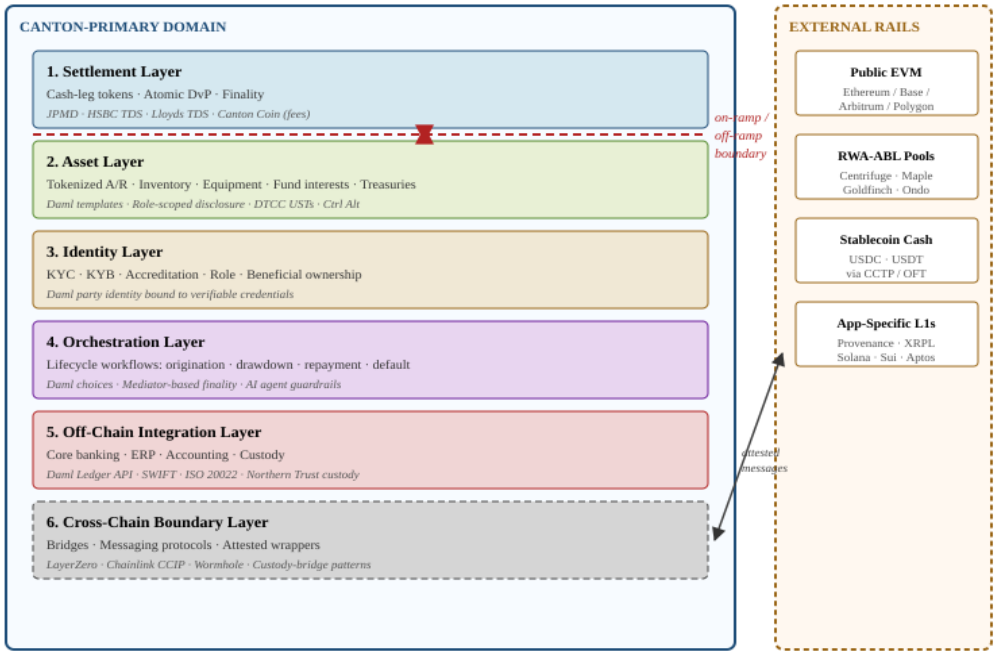
Layered reference architecture for tokenized deposit and RWA-ABL integration.

Layer	Primary primitives	Canton-primary realization	Cross-chain extension
Settlement	Cash-leg tokens, atomic DvP, finality	JPMD, HSBC TDS, Lloyds GBP TDS on Canton; CC for fees	Stablecoin / wrapped USDC via CCIP, LayerZero, or Wormhole
Asset	Tokenized A/R, inventory, equipment, fund interests, Treasuries	Daml templates with role-scoped disclosure; DTCC tokenized Treasuries; Ctrl Alt private credit	ERC-3643/7540 on Ethereum/L2s; Provenance HELOC tokens
Identity	KYC, KYB, accreditation, role	Daml party identity + verifiable credentials issued by KYC providers	Off-chain attestation oracles bridged via attested messages
Orchestration	Lifecycle workflows (origination, drawdown, repayment, default)	Daml choices, Canton mediator-based finality	Cross-chain agentic AI orchestration [32]
Off-chain integration	Core banking, ERP, accounting, custodian	API connectors, Daml ledger API, custodian integrations (Northern Trust, BNY)	SWIFT, ISO 20022 messaging gateways
Cross-chain boundary	Bridges, messaging, attested wrappers	Canton-issued wrappers of off-chain assets; PCP custody-native credit	LayerZero OFT, Chainlink CCIP, Wormhole, Axelar GMP

Figure 2 visualizes the layered model and the cross-chain boundary as a costed extension. The on-ramp/off-ramp boundary is shown as the horizontal red dashed line between the settlement and asset layers; atomic DvP eliminates this boundary within a single Canton synchronization domain. The dashed bidirectional connection to the external rails panel represents the cross-chain boundary layer, which carries the verification, opportunism, and networking costs identified in §3.1.

Figure 2

Canton-anchored reference architecture: layered model with cross-chain extension.



Note. Solid layers operate within a single trust domain (Canton synchronization domain). The dashed cross-chain boundary layer adds verification, opportunism, and networking costs [37]. The on-ramp/off-ramp boundary, shown as the red dashed line between the settlement and asset layers, is the binding architectural constraint addressed in §1. JPMD = USD JPM Coin deposit token; TDS = tokenized deposit service; CC = Canton Coin; CCIP = Chainlink Cross-Chain Interoperability Protocol; OFT = Omnichain Fungible Token; CCTP = Cross-Chain Transfer Protocol.

5.1 Settlement layer

The settlement layer is where the on-ramp/off-ramp problem is most directly addressed. In the Canton-primary realization, the cash leg is a bank-issued tokenized deposit (JPMD, HSBC TDS, Lloyds TDS, or a bank-specific issuance) native to Canton, and the asset leg is a Daml-modeled tokenized claim. Atomic delivery-versus-payment is achieved within the synchronization domain, eliminating the boundary entirely for institutions that hold accounts at participating banks.

The principal design tension is *which* synchronization domain. A private bank-operated domain offers the cleanest prudential treatment but constrains composability; the public Global Synchronizer offers full composability but routes through CC fees and a wider set of Super Validators that the bank does not control. The reference architecture recommends a hybrid: deposit-token issuance and redemption on a private domain with admission control by the issuing bank, transfer and atomic DvP composability on the Global Synchronizer through

assignment/unassignment, and explicit settlement-finality semantics modeled in Daml so that finality is a property of the contract rather than of the rail.

For institutions that do not hold accounts at participating banks, or that originate cash from public-chain stablecoin liquidity, the settlement layer must support cross-chain on-ramps. This is where stablecoin off-ramps via Brale (a Canton-native solution that converts major stablecoins into network-native equivalents) or via cross-chain messaging become necessary. The architecture explicitly distinguishes *bank-anchored cash* from *MMF-anchored cash* — they are not interchangeable for prudential purposes — and treats the choice as a parameter of the contract model.

5.2 Asset layer

The asset layer instantiates the various ABL claim types. A receivable is a Daml contract with the obligor, originator, current holder, and (optionally) a tranche manager as informees, with payment terms, advance rate, dilution reserve, and concentration limits as fields. An inventory line is a contract with reference to a warehouse-receipt or RFID-attested digital twin, with control terms encoded as Daml choices that gate release and delivery. Equipment ABL is a contract with reference to a UCC filing identifier (for U.S. perfection) and to the asset registry (which may itself be a separate Daml model). Private-credit fund interests are contracts modeled as units of a Daml-defined fund with subscription, redemption, capital call, and distribution choices. Trade-finance instruments are contracts modeled around the underlying purchase order and supply-chain stages, with stage transitions authorized by appropriate parties.

The principal tension at the asset layer is *granularity*: too coarse, and the contract cannot encode the perfection and waterfall constructs that legal counsel requires; too fine, and the contract becomes brittle and expensive to amend. The reference architecture recommends modeling each claim as a single contract with rich choice surface, and managing pool-level aggregation through separate aggregation contracts that hold references — a pattern analogous to the trust-and-trustee structure of conventional ABL.

5.3 Identity layer

Identity in Canton is rooted in the party concept: every participant in a transaction is a party, parties are hosted on participant nodes, and party identifiers are namespaced and managed by the synchronization domain's topology service. For ABL, identity must additionally encode regulatory status (Reg D 506(c) qualified purchaser; MiCAR-recognized professional client; FCA accredited; etc.), KYB completion, accreditation expiry, and beneficial-ownership relationships. The

reference architecture treats these as *verifiable credentials* issued by trusted KYC/KYB providers and bound to the Daml party identifier, with credential expiry and revocation enforced through Daml choices that check credential validity at exercise time.

Cross-chain identity is the principal off-ramp problem at this layer: a credential issued on Canton must be either re-issued or attested through a bridge to an EVM-based pool, and vice versa. Trust assumptions diverge: a bank-issued KYC credential carries strong assurance but limited cross-jurisdictional portability; a public-chain attestation may be more portable but carries weaker liability tail.

5.4 Orchestration layer

The orchestration layer is the workflow engine: how does a drawdown request propagate from the SME borrower, through the lender's underwriting, through the agent's collateral check, to the cash-leg disbursement, and how does repayment, monitoring, default, and liquidation propagate back? In a Canton-native realization, these workflows are Daml workflows: the originator creates a *DrawdownRequest*, the lender exercises an *Approve* choice, the agent exercises a *ReleaseCollateral* choice, and the cash-leg contract exercises a *Pay* choice that is atomic with the release. Each step is authorized by the appropriate signatories, scoped to the appropriate informees, and ordered through the synchronization domain.

Orchestration is also the layer where AI agents become first-class. The author's prior work [32] develops a reference architecture for AI agents on blockchain infrastructure with identity, policy, payments, and custody as composable primitives. Applied here, an AI agent could monitor receivables aging, propose paydown reallocations, or trigger margin calls under predefined policy. Canton's authorization model means that the agent's actions are constrained to choices for which it has explicit signatory rights, providing a guardrail that public-chain agents lack.

5.5 Off-chain integration layer

Tokenization is only economically meaningful if it integrates with the existing off-chain infrastructure of borrowers and lenders: ERP systems for invoice generation, core-banking systems for cash-leg origination, custody systems for asset servicing, and accounting systems for general-ledger posting. The reference architecture treats this layer as a set of bidirectional connectors implemented through the Daml Ledger API (which exposes contract state and choice surface as gRPC streams) and through standard banking messaging (SWIFT MT, ISO 20022). Northern Trust's April 2026 integration with Canton is a concrete instantiation of the custody connector for

institutional clients [46]; JPMD and HSBC TDS instantiate the core-banking connector for the cash leg.

5.6 Cross-chain boundary layer

The cross-chain boundary is treated in detail in §8 but introduced here for completeness. The reference architecture treats cross-chain messaging as a *first-class* but *cost-bearing* layer: the architect should expect that for many institutional flows, Canton-primary settlement suffices and the boundary is unnecessary; for flows that must compose with EVM-native liquidity (for example, a private-credit fund that wants to borrow against on-chain Treasuries held in Ondo OUSG), the boundary is unavoidable. The Canton ecosystem has explicit integration roadmaps with LayerZero, Wormhole, and Chainlink CCIP for bridge connectivity [47], each with different trust assumptions and operational characteristics.

6. Comparative Case Analysis

This section evaluates eleven live or imminent platforms against the on-ramp/off-ramp constraint. Six are Canton-anchored or institutionally adjacent (JPM Coin/JPMD, HSBC TDS, Lloyds TDS pilot, Broadridge DLR, DTCC tokenized Treasuries, Ctrl Alt). Five are non-Canton public-chain platforms relevant to the comparison (Centrifuge, Maple Finance, Goldfinch, Ondo Finance, Provenance/Figure). A scoring matrix is presented in Table 2.

6.1 Canton-anchored cases

JPM Coin / JPMD on Canton. *[Status: Announced.]* Announced January 7, 2026, the Digital Asset–Kinexys collaboration plans phased issuance, transfer, and near-instant redemption of JPMD natively on Canton during 2026, with subsequent integration of Kinexys Blockchain Deposit Accounts [16, 48]. JPMD is presently available on Coinbase's Base Layer 2 for institutional clients and is the bank's first native deposit token. Native Canton issuance is the strongest signal yet that the bank-money cash leg of tokenized ABL can live on the same rail as the asset leg.

HSBC TDS. *[Status: Production on HSBC Orion in five markets; pilot on public Canton.]* HSBC's Tokenized Deposit Service launched on the HSBC Orion private ledger (which itself uses Canton DLT) in May 2025 and is now live in five markets (USD, GBP, EUR, HKD, SGD across Hong Kong, Singapore, Luxembourg, the U.K., and the U.S.). On April 13, 2026, HSBC completed a pilot simulating issuance, transfer, and atomic settlement of TDS on the public Canton Network, demonstrating interoperability between HSBC's deposit ledger and external blockchain rails [5,

49]. HSBC announced the same day that TDS is now available to U.S. corporate and institutional clients.

Lloyds TDS pilot. *[Status: Pilot transaction completed; consortium pilot ongoing through mid-2026.]* Lloyds Banking Group, working with Archax and Canton, completed in January 2026 the U.K.'s first public-blockchain transaction using tokenized sterling deposits, which were used to purchase a tokenized gilt from Archax with subsequent funds movement back to Archax's standard Lloyds account [4, 50]. Lloyds operated its own validator node on Canton, and the transaction is part of the broader UK Finance GBTD consortium (Barclays, HSBC, Lloyds, NatWest, Nationwide, Santander) running through mid-2026 with industry interoperability infrastructure providers.

Broadridge DLR. *[Status: Production since 2023.]* Broadridge's Distributed Ledger Repo platform, having migrated to Canton in 2023, processes approximately USD 200 billion daily — close to USD 4 trillion monthly — in tokenized U.S. Treasury repos as of mid-to-late 2025 [27, 28]. DLR is the largest single application on Canton and demonstrates that institutional-scale tokenized financing can run on Canton at production volumes.

DTCC tokenized U.S. Treasuries. *[Status: Announced; MVP planned H1 2026, production targeted H2 2026.]* The December 17, 2025 partnership announcement, following the December 11 SEC no-action letter, plans an MVP minting subset of DTC-custodied U.S. Treasury securities on Canton in H1 2026 with production targeted for H2 2026 [25, 26]. DTCC will join Euroclear as Canton Foundation co-chair, providing institutional governance anchoring.

Ctrl Alt. *[Status: Production on adjacent rails (XRPL and other), not exclusively Canton-anchored.]* As of April 2026, Ctrl Alt has tokenized over USD 1.2 billion in alternative assets including real estate, private credit, funds, and commodities, including a USD 280 million tokenization of UAE diamond holdings and the Dubai Land Department's real-estate tokenization on the XRP Ledger [51]. While Ctrl Alt is not exclusively Canton-anchored, it represents the institutional B2B tokenization-as-a-service model that complements the Canton settlement architecture.

6.2 Non-Canton comparatives

Centrifuge. Centrifuge runs on a Polkadot-anchored chain (Centrifuge Chain) with EVM bridges to Ethereum and Base. Active loan originations exceed USD 1.1 billion across SME working capital, trade finance, and revenue-based-financing pools. Centrifuge introduced a Whitelabel tokenization service and a regulated tokenized S&P 500 index product on Base in late 2025/early 2026 [9].

Maple Finance. Following the 2022 contagion, Maple repositioned around fixed-term collateralized facilities for crypto-native trading firms and audited fintech borrowers. As of early 2026, AUM exceeds USD 4 billion with active loans around USD 2.4 billion; the syrupUSDC product reached USD 4.98 billion in transfer volume in late January 2026 [20].

Goldfinch. Outstanding loans exceed USD 340 million across emerging-market fintech lenders in Africa, Southeast Asia, and Latin America, with yields of 10–17% reflecting country and borrower risk.

Ondo Finance. As of early 2026 Ondo manages over USD 2.75 billion in TVL across OUSG (institutional-grade Treasury exposure backed by BlackRock BUIDL and other money-market vehicles, ~USD 692M–1.4B depending on measurement window) and USDY (yield-bearing tokenized note backed by short-term Treasuries and bank demand deposits, ~USD 1.4B). USDY was launched on Sei Network in January 2026, extending its multichain footprint via LayerZero [52, 53].

Provenance / Figure. Figure Markets accounts for approximately USD 15 billion of the USD 20 billion total active tokenized private-credit loan stock as of Q1 2026, dominated by tokenized HELOCs originated on Provenance Blockchain [21]. Figure went public on Nasdaq under the ticker FIGR in September 2025, valuing the firm at roughly USD 5.3–7.6 billion depending on date.

6.3 Scoring matrix

Table 2 presents an indicative scoring of these cases on five attributes relevant to integrated tokenized-deposit-and-RWA-ABL architecture: privacy granularity, cash-leg quality, asset-leg breadth, regulatory anchoring, and cross-chain interoperability. Scores are 1 (low) to 5 (high), based on public information and the author's interpretation; they should be read as indicative rather than authoritative.

Table 2

Indicative scoring matrix for tokenized deposit and RWA-ABL platforms (1–5 scale).

Platform	Privacy granularity	Cash-leg quality	Asset-leg breadth	Regulatory anchoring	Cross-chain interop
JPM Coin/JPMD on Canton	5	5	3 (cash, growing)	4	3
HSBC TDS on Canton	5	5	3 (cash, growing)	4	3

Platform	Privacy granularity	Cash-leg quality	Asset-leg breadth	Regulatory anchoring	Cross-chain interop
Lloyds TDS / GBTD	5	5	3	5	3
Broadridge DLR	5	5	3 (repo-focused)	5	2
DTCC tokenized USTs	5	5	4	5	3
Ctrl Alt	3	3	5	4	3
Centrifuge	2	2 (stablecoin)	5	3	4
Maple Finance	2	2	4	3	4
Goldfinch	2	2	3	3	4
Ondo Finance	2	4 (Treasury-backed)	4	4	5
Provenance/Figure	3	3	4 (HELOC heavy)	4	3

The pattern is informative. Canton-anchored institutional platforms dominate on privacy granularity, cash-leg quality, and regulatory anchoring; public-chain platforms dominate on asset-leg breadth and cross-chain interoperability. The reference architecture aims to combine the strengths by anchoring core settlement and identity on Canton while using the cross-chain boundary to import asset breadth and liquidity from public-chain pools where appropriate.

7. Quantitative Model

This section develops an *illustrative quantitative model* — not an empirical study — that compares Canton-primary, EVM-based, and hybrid configurations of tokenized ABL across three SME credit use cases: accounts receivable, inventory and equipment ABL, and private credit fund interests. The aim is to make the architectural choices in §5 economically legible by quantifying their effects on settlement latency, capital lockup cost, fees, and reconciliation overhead. Assumptions are explicit; results are framed as indicative.

7.1 Model structure

Total economic cost per dollar financed over a typical financing cycle is decomposed as:

$$C_{total} = C_{settle} + C_{lockup} + C_{fees} + C_{recon}$$

where:

- C_settle is the cost of settlement latency: capital tied up between drawdown request and disbursement, between repayment receipt and pool release, and (for cross-chain configurations) during bridge confirmation windows.
- C_lockup is the opportunity cost of capital tied up beyond the strict economic financing period due to operational gating, reserves required by the rail, or stablecoin off-ramp queues.
- C_fees is the explicit fee load: chain fees, application fees, bridge fees where applicable, and platform spread.
- C_recon is the reconciliation overhead: labor and systems cost of reconciling tokenized claims against off-chain records (ERP, bank statements, custody reports).

Each component is parameterized at the use-case level. Settlement latency is expressed in hours; lockup is the product of latency and the opportunity-cost rate (assumed to be a money-market or repo rate, illustratively 4.5% per annum based on early-2026 policy rates); fees are expressed as basis points of notional; reconciliation is expressed in dollars per transaction or per pool per month, drawn from SME factoring industry benchmarks.

7.2 Parameter sources and assumptions

The illustrative parameters are drawn from two source classes. *Public benchmark data* from Canton, JPMD, HSBC, Broadridge, and DTCC pilot disclosures inform the Canton-primary settlement-latency and fee parameters; published Ethereum mainnet and L2 (Base, Arbitrum) gas data inform EVM parameters; published bridge fee and confirmation-time data from LayerZero, Wormhole, and CCIP inform hybrid parameters. *SME A/R financing economics* from factoring industry data — advance rates of 80–95%, terms of 30–90 days, factoring fees of 1–4% per transaction or per month, with reconciliation labor costs typically 20–40 basis points of pool notional annually for traditional factors — inform the use-case parameters for receivables [54, 55, 56, 57].

Limitations are substantial. Canton fee structure is governed by a USD-denominated traffic price (currently approximately USD 60 per megabyte, set by the Tokenomics Committee under CIP-0084) and burned application/usage fees that depend heavily on featured-application status and round dynamics [41]; JPMD fees on Canton are not publicly disclosed at the time of writing; HSBC TDS is in pilot and has not published per-transaction fees. EVM gas costs are highly variable; published L2 fees of approximately USD 0.02–0.20 per simple transaction and USD 0.10–0.50 per complex DEX swap on Base, Arbitrum, and Polygon are used as ranges [58]. Bridge fees of

approximately 0.05–0.20% of notional plus a fixed gas component are typical for institutional-grade messaging.

Table 3

Illustrative parameter table for the comparative cost model.

Parameter	Canton-primary	EVM-based (L2)	Hybrid (Canton + bridge)
Settlement latency (drawdown to disbursement)	5–30 sec	1–3 min on L2 + 7–60 min L1 finality if needed	2–15 min including bridge confirmation
Per-transaction chain fee	<USD 0.50	USD 0.02–0.50 (L2)	USD 0.10–2.00
Bridge fee (where applicable)	n/a	n/a	5–20 bps of notional + gas
Application/platform spread	Use-case dependent (illustratively 50–150 bps)	100–300 bps for private credit pools	Sum of both, depending on architecture
Reconciliation cost (annualized, % of pool)	5–15 bps (programmatic)	10–25 bps (programmatic, but custody/off-chain-bridge gaps)	15–35 bps (two ledgers to reconcile)
Opportunity cost of lockup capital	4.5% p.a. (assumed, MMF/repo benchmark)	4.5% p.a.	4.5% p.a.

7.3 Worked examples

Use case A: SME accounts receivable, 60-day terms. Notional pool: USD 10 million. Advance rate: 85%. Factoring fee equivalent: 2% per transaction. The numerical results across rail configurations are tabulated in Table 4; the qualitative differences are as follows.

In a Canton-primary configuration the cash leg is a bank-issued tokenized deposit (TDS or JPMD) and the advance is disbursed atomically within seconds of approval. Reconciliation collapses to deterministic Daml-modeled posting; the TDS fee is the dominant fee component (Canton traffic fees are negligible at invoice scale); capital lockup beyond the economic 60-day period disappears. The bulk of the indicative 50–80% compression is therefore reconciliation and lockup compression rather than gross fee compression. In an EVM-based configuration with USDC cash leg, settlement latency is comparable on L2 but cash-leg quality is materially lower (MMF-anchored bearer claim versus bank deposit), reconciliation gains are partial because off-chain custody bridges remain

manual, and bridge fees apply if the pool is composed across L1/L2 — the cash-leg-quality differential is not directly priced in the model but is a regulatory and prudential cost. The hybrid configuration combines Canton-primary settlement with a messaging-protocol bridge to import USDC liquidity when bank deposits are unavailable, accepting bridge cost in exchange for cash-leg flexibility.

These reductions should be interpreted as scenario-model outputs based on the stated assumptions in §7.2, not as measured production results from live SME A/R deployments. The figures in Table 4 are intended to identify cost drivers and the relative ordering across architectures rather than to estimate realized savings in any specific deployment.

Use case B: Inventory / equipment ABL, 90-day cycle. Notional: USD 5 million. Advance rate: 75% (lower than A/R because asset is less liquid). Conventional ABL pricing: SOFR + 350–500 bps with monitoring fees. Reconciliation involves periodic borrowing-base certificates, third-party appraisals, and field exams.

The Canton-primary configuration shifts the borrowing base to a continuously-updated Daml contract where IoT/RFID-attested inventory state is a contract field updated by an authorized oracle. Settlement latency for incremental advances drops from days to minutes; reconciliation overhead drops by 50–70% (illustratively from 50 bps to 15–20 bps p.a.), driven primarily by the elimination of monthly borrowing-base reconciliation labor. Cash-leg quality is again critical, particularly for equipment ABL where the lender is often a regional bank; Canton-primary with bank-issued TDS is materially cleaner than EVM with stablecoin.

Use case C: Private credit fund interests, quarterly liquidity windows. Notional: USD 50 million fund interest. Conventional structure: NAV-based redemption with 90-day notice, gates at 5% per quarter. Tokenization changes the redemption mechanic substantially: instead of NAV redemption windows, holders trade fund-interest tokens on secondary markets at market-clearing prices.

Comparison here is less about within-cycle latency and more about *redemption optionality* and capital lockup during stress. The Q1 2026 BCRED episode illustrates the cost of conventional gates [20]; tokenized pools on Centrifuge, Maple, and Goldfinch have not gated under similar stress, though the data set is small and survivorship-biased. A Canton-primary configuration adds the bank-grade cash-leg quality that public-chain pools currently lack, which expands the addressable LP base to bank treasuries that cannot hold MMF-anchored stablecoin claims.

Table 4 summarizes the worked examples on a single row-per-use-case basis, allowing direct comparison of the four cost components across rail configurations. Figure 3 visualizes the cost

stack for Use Case A — the headline SME accounts-receivable scenario — making the source of compression (predominantly reconciliation and lockup, not fees) visible at a glance.

Table 4

Worked-example results matrix: total cost per dollar financed across rail configurations.

Use case / metric	Counterfactual (traditional)	Canton-primary	EVM-based (L2)	Hybrid (Canton + bridge)
Use Case A: SME A/R, 60-day terms (USD 10M pool, 85% advance rate)				
Settlement latency	1–3 days	5–30 sec	seconds (L2) + finality	2–15 min (incl. bridge)
Fee load	~2% per transaction	~25 bps (TDS) + traffic	100–300 bps platform spread	~25 bps + ~10 bps bridge
Reconciliation cost	~30 bps p.a.	~10 bps p.a.	10–25 bps p.a.	15–35 bps p.a.
Total cost per dollar (60-day cycle)	**~200 bps**	**35–60 bps**	**60–110 bps**	**50–80 bps**
Use Case B: Inventory / equipment ABL, 90-day cycle (USD 5M pool, 75% advance rate)				
Settlement latency (incremental advances)	days (BB cert cycle)	minutes (oracle update)	minutes (oracle + L2)	minutes + bridge confirmation
Fee load	SOFR + 350–500 bps + monitoring	SOFR + ~250 bps + monitoring	SOFR + 300–400 bps	SOFR + ~275 bps + bridge
Reconciliation cost	~50 bps p.a. (BB certs, exams)	15–20 bps p.a.	20–30 bps p.a.	25–40 bps p.a.
Indicative compression vs counterfactual	**baseline**	**50–70%**	**30–50%**	**40–60%**
Use Case C: Private credit				

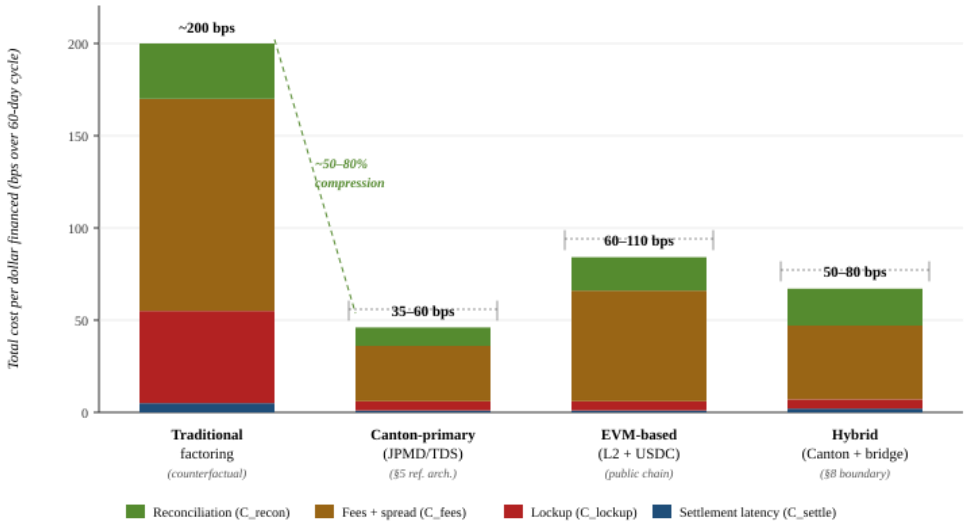
Use case / metric	Counterfactual (traditional)	Canton-primary	EVM-based (L2)	Hybrid (Canton + bridge)
fund interest, quarterly liquidity (USD 50M position)				
Redemption mechanic	NAV gates, 90-day notice, 5% per quarter	Secondary market, market-clearing price	Secondary market (less liquidity depth)	Secondary on Canton, bridge to public
LP base addressable	MMF, family office, allocator	+ bank treasuries, insurance	Crypto-native funds primarily	Both bank and crypto-native
Capital lockup under stress	**90 days+ (gating risk)**	**Continuous (no gating to date)**	**Continuous (small data set)**	**Continuous (Canton side)**

Note. Use Case A figures match the §7.3 worked example; Use Case B and C are derived analogously from §7.3 prose. Compression bands assume the §7.2 parameter ranges. SOFR = Secured Overnight Financing Rate; BB cert = borrowing-base certificate; bps = basis points; p.a. = per annum; NAV = net asset value; MMF = money-market fund; LP = limited partner.

Figure 3 decomposes Use Case A — the headline SME accounts-receivable scenario — into its four cost components, comparing the traditional factoring counterfactual against the three tokenized rail configurations. Two patterns are visible. First, the bulk of the compression in Canton-primary comes from reconciliation and capital-lockup gains rather than gross-fee compression — the platform spread on Canton is not radically lower than on EVM-based pools, but the elimination of multi-day settlement queues and manual reconciliation collapses C_lockup and C_recon together. Second, the EVM-based and hybrid configurations both improve materially over the traditional counterfactual but cluster well above the Canton-primary range, reflecting the cash-leg-quality differential and the bridge cost respectively.

Figure 3

Cost-stack comparison for Use Case A: SME accounts-receivable financing, 60-day cycle.



Note. Stacked bars show the decomposition of total cost per dollar financed (in basis points) into the four model components: settlement latency (C_settle), capital lockup (C_lockup), fees and platform spread (C_fees), and reconciliation overhead (C_recon). Bracketed ranges above each tokenized-configuration bar reflect the §7.2 parameter uncertainty. The traditional-factoring counterfactual is shown at its midpoint; in practice it ranges roughly 150–250 bps depending on factor scale and counterparty risk. Compression annotations are illustrative; see §7.4 sensitivity analysis.

7.4 Sensitivity analysis

The headline finding — that Canton-primary configurations produce indicative 50–80% reductions in total cost-per-dollar-financed for SME A/R, with smaller but material gains for inventory/equipment ABL and structural changes for private credit fund interests — is sensitive to four parameters.

First, *opportunity-cost rate*. At a 2% rate (low-rate regime), latency-driven lockup gains shrink proportionally; at 8% (stressed regime), they widen. The 4.5% baseline is mid-range.

Second, *reconciliation cost in the counterfactual*. SME factors with mature scale operate near 20 bps; sub-scale or specialty factors operate near 50 bps; the gain from tokenization is largest where the counterfactual reconciliation is most expensive.

Third, *bridge fees and confirmation times in hybrid configurations*. If bridge fees exceed approximately 25 bps or confirmation windows exceed 30 minutes, the hybrid configuration loses much of its advantage over either pure rail; this is the primary lever distinguishing well-designed from poorly-designed cross-chain architectures.

Fourth, *Canton fee structure under load*. The current USD 60/MB traffic pricing and CC fee burn dynamics are governance-set parameters that may shift; a 3x increase in traffic pricing would still leave per-transaction fees small for invoice-scale messages but could matter for high-frequency monitoring flows.

The model is illustrative. The author makes no claim that the absolute numbers will hold in any specific deployment; the *relative* ordering and the identification of the binding parameters are the more robust outputs.

8. Cross-Chain Boundary Discussion

The cross-chain boundary is where the architecture either succeeds or fails for institutional ABL. Three architectural patterns are common, each with distinct trust assumptions and operational characteristics.

The first pattern is *custody bridges*: a regulated custodian (e.g., BitGo, Coinbase Custody, Fireblocks) holds a source-chain asset and issues a destination-chain wrapper. Trust collapses to the custodian's operational and legal posture. This is the dominant pattern for fiat-on-ramps and for many tokenized-Treasury wrappers. It is robust against smart-contract exploits but vulnerable to custodial failure and to liability tail.

The second pattern is *messaging-protocol bridges*: LayerZero, Chainlink CCIP, Wormhole, Axelar, and Hyperlane each deliver attested messages between chains. LayerZero V2 introduced Decentralized Verifier Networks (DVNs) that allow each application to choose its X-of-Y-of-N validation set, with operators including Google Cloud, Chainlink, and independent stakers; LayerZero reports zero core protocol exploits to date and supports more than 120 networks [59]. Chainlink CCIP adds an Active Risk Management Network that can halt suspicious activity and a separate Risk Management Network that re-derives Merkle roots independently. Wormhole's 19-Guardian model has the longest volume track record (USD 65B+ transferred) and was the only bridge unconditionally approved by Uniswap's Bridge Assessment Committee. Trust assumptions vary: small fixed validator sets (Wormhole) versus broader configurable sets (LayerZero, CCIP) versus dedicated Proof-of-Stake chains (Axelar). The Ronin (USD 625M, 5-of-9 validator compromise) and Wormhole (USD 326M smart-contract exploit) and Nomad (USD 190M) hacks illustrate the failure modes.

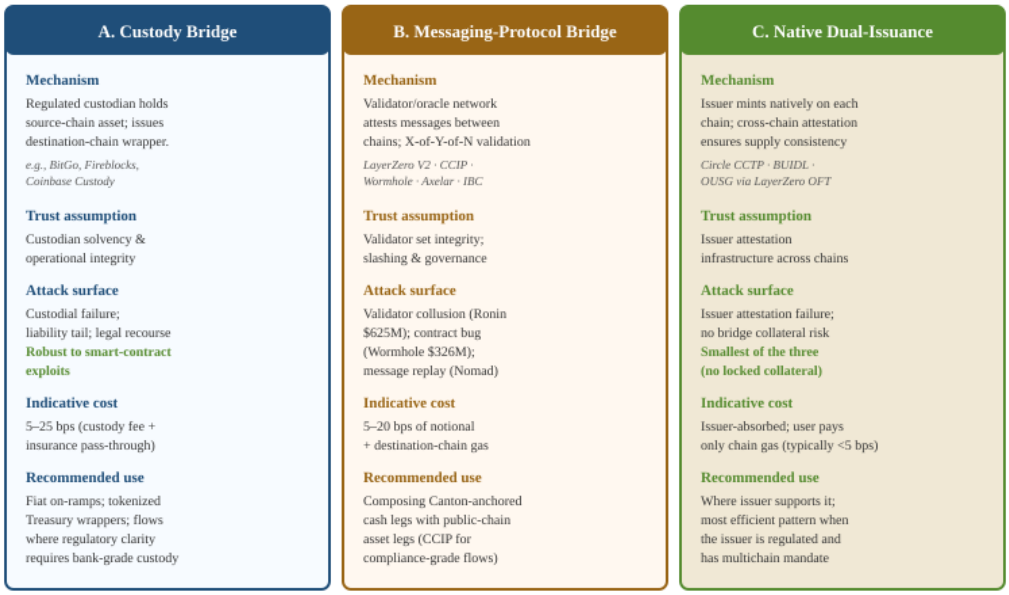
The third pattern is *native dual-issuance with attestation*, where the issuer (typically a regulated entity such as Circle, Paxos, or a bank) issues the token natively on multiple chains and uses a cross-chain attestation protocol to ensure global-supply consistency rather than locking-and-

minting. Circle's CCTP (Cross-Chain Transfer Protocol) is the canonical example. This pattern eliminates the bridge-collateral attack surface but requires the issuer to maintain attestation infrastructure across all supported chains.

Figure 4 summarizes the comparative tradeoffs across the three patterns on mechanism, trust assumption, attack surface, indicative cost, and recommended use.

Figure 4

Cross-chain boundary patterns: comparative tradeoffs.



Note. Three architectural patterns for moving asset or cash legs between Canton and external rails. Trust assumption, attack surface, and indicative cost differ materially across patterns; the architect should match pattern to flow characteristics rather than choose globally. CCIP = Chainlink Cross-Chain Interoperability Protocol; IBC = Inter-Blockchain Communication; CCTP = Cross-Chain Transfer Protocol; OFT = Omnichain Fungible Token; bps = basis points.

For the Canton-anchored architecture, the public Canton ecosystem has documented integration roadmaps with LayerZero, Wormhole, and Chainlink CCIP for bridging Canton-issued assets to over 120 networks and importing assets from those networks [47]. The pattern recommendations are as follows.

For institutional flows where all counterparties hold accounts at participating banks and use native Canton tokenized deposits, Canton-primary suffices and the cross-chain boundary should be *avoided*. This includes most JPMD-, HSBC-, and Lloyds-anchored corporate flows. The total cost-of-bridge analysis in §7 dominates here.

For flows that must compose with public-chain liquidity — for example, a private-credit fund whose LPs include both bank treasuries (Canton-native) and crypto-native funds (EVM-native), or a borrower that holds Treasury collateral in Ondo OUSG — the boundary is unavoidable and the choice is among messaging protocols. The recommended pattern is to *issue the cash leg natively on Canton* and to use a messaging-protocol bridge (CCIP for institutional-grade compliance posture; LayerZero for breadth and cost) to attest the asset leg. This minimizes the attack surface on the cash leg while accepting bridge risk on the asset leg, where pricing can absorb the residual risk premium.

For flows whose primary liquidity is on public chains and where Canton is a destination rather than a source, the recommended pattern is *native dual-issuance* where the issuer supports it (e.g., USDC via CCTP, BUIDL across multiple chains, OUSG via LayerZero OFT) and a tightly governed messaging-protocol bridge otherwise.

The capital-efficiency tradeoffs are explicit: every bridged-asset position carries an additional 5–25 bps of bridge insurance cost (whether priced explicitly or absorbed by the issuer), additional 5–60 minutes of settlement latency, and additional reconciliation overhead between the source-chain and destination-chain ledgers. For SME A/R-scale flows where the per-invoice notional is modest and the per-invoice fee tolerance is a few basis points, the bridge cost can dominate the architecture; for larger flows it is a tractable risk premium.

9. Implications and Recommendations

The architecture and analysis support specific recommendations differentiated by stakeholder.

9.1 For banks

Banks should treat tokenized deposit issuance not as a payments product but as the *cash leg of a tokenized credit franchise*. The competitive question over the next 24 months is which banks issue native deposit tokens on the same rail where their institutional clients are conducting tokenized financing — Canton being the leading candidate based on current institutional adoption. The reference architecture suggests that the highest-leverage early move is a private synchronization domain for issuance and redemption, connected to the public Canton Global Synchronizer for atomic DvP composability with non-bank counterparties. Banks should also begin building the Daml templates for their priority ABL products (receivables, inventory, equipment, trade finance) so that asset-leg integration is ready when the cash leg goes live. The author's prior work on hybrid tokenized-deposit and stablecoin interoperability for regional banks [17] develops this argument in greater operational detail.

The threshold that would change this recommendation is a credible competing institutional rail with comparable adoption density; on present evidence, few alternatives show the same concentration of bank-money, securities-infrastructure, repo, custody, and privacy-preserving settlement activity.

9.2 For non-bank lenders

Non-bank lenders — private-credit funds, BDCs, factors, fintech credit platforms — should treat the Canton boundary as an *opportunity rather than a competitive threat*. Canton-anchored deposit tokens provide a bank-grade cash leg that public-chain ABL platforms have lacked, expanding the addressable LP base to bank treasuries and insurance balance sheets that cannot hold MMF-anchored stablecoin claims. The recommended posture is to maintain primary issuance on whichever rail best fits the asset class (Provenance for HELOC, Centrifuge for SME working capital, Maple for institutional facilities) but to add Canton as a *settlement and LP-onboarding* rail through a cross-chain pattern.

The threshold that would change this recommendation is a sustained failure of bank-issued tokenized deposits to achieve material adoption — for example, if regulatory friction stalls JPMD-on-Canton or if HSBC TDS does not extend to lending-collateral applications.

9.3 For SME borrowers and treasurers

SME borrowers stand to benefit most from the architectural compression but are least able to drive adoption. The recommended posture is to *prefer financing partners with tokenized rails*, particularly for receivables and trade finance where the fee compression in the §7 worked example is largest, and to require that any tokenization wrapper preserves bank-grade deposit-quality cash-leg settlement. Treasurers should treat tokenized deposit issuance by their primary banks as an early signal of the broader rail their corporate banking relationships are likely to migrate toward over the next 24–36 months, and structure ERP integration accordingly.

9.4 Regulatory considerations

The regulatory anchors are converging in directions favorable to the architecture. The FDIC's April 2026 proposed rule on tokenized deposits, the December 2025 SEC no-action letter for DTC tokenization, MiCAR's clear separation of bank tokenized deposits from stablecoin-style ARTs/EMTs, the Basel Committee's prudential treatment of cryptoasset exposures (which preserves favorable treatment for tokenized representations of traditional assets where economic equivalence holds), the Financial Stability Board's recommendations on global stablecoin arrangements, and BIS Project Agora's experimental integration of tokenized commercial-bank

deposits with tokenized wholesale CBDC together establish a regulatory perimeter within which the Canton-anchored architecture is operable in major jurisdictions [15, 26, 60, 61]. The principal residual uncertainties are cross-jurisdictional perfection of security interests in tokenized collateral and the application of MiCAR's CASP licensing regime to tokenization-as-a-service providers operating across the Canton boundary. The author's prior work on regulatory practices in emerging markets [30] and on use-case-driven blockchain architectures [18] addresses adjacent dimensions of this regulatory landscape.

10. Limitations and Future Work

This paper has substantive limitations, several of which are worth flagging explicitly for SSRN readers and reviewers.

First, Canton-specific empirical data on settlement latency, fees under load, and reconciliation overhead remain materially thinner than EVM data, and the quantitative model in §7 should be read as illustrative rather than empirical. The numbers presented are derived from a mix of public benchmark data and analytically reasoned parameters; they have not been measured against production deployments at SME-A/R-scale because such production deployments do not yet exist at scale. As JPMD-on-Canton, HSBC TDS, and DTCC tokenized Treasuries reach production during 2026–2027, the parameters in Table 3 should be revised with measured data.

Second, the architecture is necessarily prospective at the cross-chain boundary. Canton's bridge integrations with LayerZero, Wormhole, and CCIP are described in roadmap documents rather than production deployments at the time of writing, and the specific operational characteristics of those bridges in production (fees, latency, attack-surface posture) cannot be modeled with high confidence.

Third, the legal-perfection treatment of tokenized collateral remains jurisdictionally fragmented. UCC Article 12 in the United States, the UK Law Commission's digital-asset proposals, and EU developments under MiCAR's broader perimeter are converging but not yet uniform. The architecture treats perfection as a property of the off-chain integration layer that must be addressed jurisdiction-by-jurisdiction; it does not prescribe a uniform legal solution.

Fourth, agentic AI in the collateral lifecycle — automated monitoring, margining, paydown reallocation, default triggering — is identified in §5.4 as a natural extension but is not developed here. The author's working paper on AI agents on blockchain infrastructure [32] provides the natural follow-on, and the integration of that architecture with the present one is a priority for subsequent work. A second priority is empirical calibration of the §7 model against measured

Canton deployments as they reach production scale. A third is the cross-jurisdictional perfection question, which warrants its own dedicated treatment.

The intersection of explainable AI for credit decisioning [31] with the orchestration layer of this architecture is a further avenue of integration: a tokenized ABL pool's underwriting and monitoring decisions, if executed by AI agents, must be auditable and explainable to credit committees and regulators, and Canton's sub-transaction privacy together with Daml authorization scopes provide a natural substrate for exposing only the explanation surface that each role is entitled to.

11. Conclusion

The on-ramp/off-ramp boundary between fiat-denominated deposit rails and on-chain collateralized credit is, on the evidence assembled here, the binding architectural constraint on capital efficiency, settlement risk, and reconciliation overhead in tokenized SME and middle-market finance. Tokenized deposits and tokenized RWA-ABL have evolved as complementary halves of a single capital-flow architecture, but largely independently — institutional bank money on Canton and adjacent permissioned rails, on-chain ABL on Ethereum and its rollups — and the cost of crossing the boundary has consumed much of the efficiency gain that motivated tokenization in the first place.

The Canton-anchored reference architecture developed in §5 takes that boundary seriously, treating sub-transaction privacy, synchronization-domain composability, the Daml authorization model, and the Super Validator topology as load-bearing primitives that together permit within-Canton atomic DvP between bank-grade cash legs and tokenized asset legs. The illustrative model in §7 suggests this architecture compresses total financing cost by roughly 50–80% for SME accounts-receivable use cases, with the bulk of the gain attributable to reconciliation and lockup rather than fees. These figures are directional model outputs rather than measured production results. The cross-chain boundary patterns in §8 show how to extend the architecture into public-chain liquidity without surrendering the cash-leg quality on which institutional adoption depends. The stakeholder implications and regulatory anchors are set out in §9.

This paper offers a reference architecture, not a final blueprint. As Canton institutional deployments reach production scale during 2026–2027, the parameters in §7 should be revised against measured data, the cross-chain patterns in §8 should be revised against production bridge characteristics, and the legal-perfection treatment in §9.4 should be revised as cross-jurisdictional standards converge. The author intends to develop these revisions, together with the agentic-AI extension of the orchestration layer, in subsequent work.

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