

Umbria Network

A Multi-Chain Asset Bridge Powered by a Capital-Efficient Liquidity Lending Protocol

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Abstract

The Umbria Network bridge is a capital-efficient, multi-chain asset bridge which enables the cheap and fast migration of fungible assets between cryptocurrency networks. It uses a novel liquidity lending protocol that greatly decreases the cost of transferring funds between chains in comparison to traditional validator-driven mint/burn, lock/unlock bridges. The Umbria Network bridge protocol also offers a remarkable improvement in speed-to-finality for cross-chain asset bridging, when compared to other popular bridging methods. The protocol lowers the cost, and increases the speed of cross-chain bridging by replacing costly and slow on-chain operations with a quick and cheap multi-chain oracle system.

The Umbria Network bridge protocol uses crowd-sourced liquidity to facilitate bridging of cryptocurrency assets across chains. The bridging protocol generates fee-based rewards to liquidity providers, as an incentive for liquidity provision. Umbria Network's liquidity-bridging model facilitates a new set of financial opportunities for DeFi and NFT users who require faster and/or lower-cost bridging.

Introduction

Cross-chain asset bridges have become an increasingly integrated component of the Ethereum-based dApp ecosystem, as more projects deploy their application logic on Layer 2 networks and Ethereum scaling solutions. Developers are moving away from the Ethereum Network as the primary execution layer for computational work for their dApps, due to the cost of gas often reaching incredible highs. In the worst case, the Ethereum Network's congestion issues render many dApps cost-prohibitive for the end-user, and in the best case, it greatly negatively impacts their effectiveness.

The widely-adopted solution to the issue of the rising gas cost on Ethereum, is to delegate the on-chain computational work to a secondary network (Layer 2), which can reach transaction finality with greater efficiency in cost and speed than the Ethereum Network, even when the Ethereum Network's level of congestion is low. While this solution has proven extremely effective in increasing the scalability and throughput of Ethereum-based dApps, it has one major caveat - the fragmentation of asset liquidity between networks. The Ethereum network can be thought of as a silo, in so much as it does not provide its own communication standard to transmit messages to outside networks. This has caused liquidity fragmentation issues, as the landscape of dApps are deployed on a set of distinct, incommunicable cryptocurrency networks.

A user's ability to participate freely across many dApps hosted on distinct networks is a function of the extent to which they can freely move their assets between those networks. Historically, onboarding users to networks outside of Ethereum has been a major friction-point, with regards to both cost and speed. There have been multiple attempts to create trustless asset bridges, which rely on extremely computationally expensive smart contracts that must satisfy a wide array of cryptographic assurances to operate securely - all of which are computed on-chain. These bridges use a burn/mint lock/unlock model, where assets are tied up or released on one cryptocurrency network, and minted or burned on the other network. Such bridges are greedy in their use of gas, as all computational work must be done on-chain - and since much of the work is done on the Ethereum network, the cost-effectiveness worsens as Ethereum congestion increases. Speed is also an issue, with some cross-chain bridges taking hours to finalise cross-chain transactions due to constraints in the security/validation requirements of the underlying protocol.

Umbria offers an improved solution to the burn/mint lock/unlock model of bridging, by introducing a novel liquidity-driven model for bridging. The protocol hosts liquidity pools of singular assets on distinct networks, and a decentralised oracle system, which removes the necessity for much of the cumbersome on-chain computational work. The Umbria

Network bridge greatly reduces the cost of bridging assets between Ethereum and Layer 2 networks, or from Layer 2 to Ethereum - often by greater than a factor of 10, while also reducing the time to transaction-finality. To achieve this, Umbria Network uses asset liquidity seeded from community liquidity providers, who earn a bridging fee proportional to the amount of liquidity they lend to the protocol. Umbria is not constrained by the efficiency bottle-necks of smart contracts on the Ethereum network, and its cost is simply a function of the sum of the gas cost of:

- a) a single transaction on the starting network, and the gas cost of a single transaction on the destination network

and

- b) A small liquidity provider fee reward.

Since one of the transaction costs is generated by the Layer 2 network, the impact of that cost is virtually nil. So, the cost of bridging assets on the Umbria Network bridge is approximately the cost of a single transaction on the Ethereum Network, plus the liquidity provider fee.

The final result is an extremely cost-effective bridge which can reach transaction finality in seconds. A secondary consequence of the Umbria Network bridge's speed is that it is able to facilitate many transactions in quick succession, resulting in extreme capital-efficiency. Umbria Network's extreme capital efficiency enables it to generate extremely high fee rewards for liquidity providers, compared to the amount of liquidity lent to the system. The Umbria Network bridge incentivises liquidity provision as a function of the total value of currently staked assets and the volume of bridging on the system. The highly capital-efficient protocol hence maximises the amount of fees generated for liquidity providers in comparison to the value of their stake.

The Umbria Network bridge uses a blockchain-agnostic oracle system, which is extensible to an arbitrary number of otherwise incompatible cryptocurrency networks. The oracle can be thought of as a standardisation layer between cryptocurrency networks, which would otherwise have no means of direct communication, and hence no way to securely migrate assets between each other. The Oracle protocol recognises key on-chain events that represent the intent to bridge assets from one network to another, by listening to network activity on each network. The Oracle then takes the appropriate action to complete the asset migration, by sending funds to the user on the destination chain, from the liquidity pool on the destination chain.

Bridging Process

Umbria network supports a number of methods for bridging assets between cryptocurrency networks. Users can interact with the bridge using a range of popular cryptocurrency wallets, such as Metamask, or send raw transactions to the bridge address, which are fulfilled automatically by the bridge Oracle. Umbria Network provides two user-friendly interfaces for bridging cryptocurrencies between networks. The first is a web page on the official Umbria Network website. The second is a customisable/brandable widget that other projects integrate into their dApps to bring a familiar user-experience to their community during the cross-chain bridging process. Users can also send assets directly to the bridge wallet address, and the Oracle system will automatically detect their intentions and complete the bridging process without the need for further user-intervention.

The Umbria Network bridging process begins with the user sending their assets to a bridge's respective bridge address. Each bridge has a distinct address that represents the entry point into the Umbria Network bridge protocol. The bridge addresses are constantly monitored by the Oracle system, which takes action when bridging transactions are confirmed by the underlying cryptocurrency network. When a user sends assets to the Umbria Network bridge, the transaction is confirmed by the blockchain, and the oracle triggers a second transaction on the destination network from the corresponding liquidity pool. The second transaction uses liquidity provided by the liquidity providers to send the assets back to the user, into their wallet on the destination chain. Once the second transaction is confirmed on the destination chain, the bridging process is complete.

The oracle is designed in such a way that all steps of the bridging process are publicly documented and viewable on the blockchain, and hence the Umbria Network bridge adopts the transparency assurances of the underlying cryptocurrency networks on which the transactions are based. Each step of the bridging transaction can be viewed on the underlying network's respective blockchain explorer.

Ultimately, handling all elements of the bridging process on-chain is cumbersome and unnecessary. The oracle system negates the unnecessary on-chain operations which can be handled off-chain, while maintaining the cryptographic security and transparency of the underlying cryptocurrency network. By doing so, the Umbria Network bridge is able to increase efficiency of much of the computational work and lower gas cost of the bridging process, while not compromising on the cryptographic security of the underlying cryptocurrency networks. A consequence of refactoring the bridging process in such a way is that transaction cost is often a factor of 10 or more cheaper than other cross-chain bridges - speed is also increased by a factor of 10 or more.

As a consequence of quick transaction finality, the Umbria Network bridge has extreme capital-efficiency. The Umbria Network Bridge's maximum bridging volume is a function of its available asset liquidities and the speed at which the bridge can finalise bridging transactions between the set of available networks. The Umbria Network bridge restricts the maximum bridge transaction size to 30% of the total supplied liquidity of a given asset, to eliminate the risk of race conditions between two large simultaneous transactions. Layer 2 networks have extremely fast block times, often around the 1 second mark, and the Ethereum network has an average block time of less than 15 seconds. This means that in the theoretical best case, the Umbria Network bridge can bridge 30% of its entire liquidity once every 16 seconds. The Umbria Network bridge hence calls for a very small amount of liquidity to facilitate a large volume of cross-chain transactions. This is advantageous for a few reasons:

- a) Bootstrapping the minimum required liquidity from the community is easy
- b) The incentive for hacking the bridge is reduced because there is limited liquidity
- c) The fee rewards generated by liquidity providers are incredibly high

Once a bridging transaction is complete, the liquidity pool of the starting network has an imbalance of liquidity in its favour, and less of the asset is present in the liquidity pool on the destination network. The fees generated by the side of the bridge which sees more volume are proportionately higher as a consequence of the greater volume. This incentivises liquidity providers to move their assets to the side of the bridge with more demand. Sometimes, a pool's assets become disproportionately unbalanced on one side of the bridge and must be rebalanced by using the official native validator-driven bridge of the underlying network. The cost of doing so is negligible, because a single bridging event can rebalance a high volume of assets.

The Umbria Network bridge is bi-directional, meaning that it can facilitate the cross-chain bridging of assets from Layer 2 to Ethereum or from Ethereum to Layer 2 with comparable cost and speed. Due to its computational work being largely removed from the underlying networks on which the bridging takes place, there is limited risk of bridging becoming cost-prohibitive, should the cost of gas increase dramatically. The Umbria Network bridge suffers Ethereum network congestion less, when compared to burn/mint lock/unlock bridges which rely on smart contracts. In the event of an increase in the price of gas on the Ethereum Network, the Umbria Network bridge still only needs to send one Ethereum transaction to satisfy the bridging process. Whereas, other bridges need to fulfil a vast array of complex computational tasks on-chain, all of which suffer an increase in cost.

Another advantage of the Umbria Network bridge is that, unlike many other bridges, it is able to support networks' native assets (non ERC-20), such as Ether on Ethereum, or MATIC on Polygon. The Umbria Network bridge does not require assets to be tokenised (wrapped) using a smart contract. This provides two advantages:

- a) There is no extra costly wrapping step that users must complete.
- b) Native asset transactions use less gas than ERC-20 token transactions.
- c) Users do not need to unwrap assets after bridging

The bridge charges a small liquidity provider fee to incentivise liquidity provision in the bridge liquidity pools. The bridging fee generates rewards for the liquidity providers and incentivises the provision of liquidity on the network with the highest demand for bridging.

Liquidity Lending

Liquidity providers lend their assets to the Umbria Network bridge protocol and earn fees whenever someone uses the bridge to migrate assets between cryptocurrency networks. There are two types of liquidity provision in the Umbria Network bridge:

- 1) Liquidity providers lend a single asset to the bridge on a single network and earn 40% of the bridging fee whenever someone bridges that asset to that network.
- 2) Liquidity providers lend **\$UMBR** tokens to the bridge on:
 - a) the Polygon Network and earn 60% of the bridging fee whenever someone bridges any asset to the Polygon Network.

Or

 - b) the Ethereum Network and earn 60% of the bridging fee whenever someone bridges any asset to any network except the Polygon Network.

Liquidity providers earn fees in the asset they lend to the protocol, and do not incur impermanent loss, unlike other DeFi pools where pairs of assets are staked together. Liquidity providers are free to unstake their liquidity at any time. When a liquidity provider unstakes their assets, the assets are automatically sent to their cryptocurrency wallet, on the network from which they initially lent their assets. Liquidity providers pay the gas cost of sending the assets back to their wallet in the asset which they are unstaking.

Once per hour, the liquidity provider fee rewards are added to the liquidity providers' staking balances automatically. This causes staking balances to auto-compound and accrue a greater proportion of the total pool fee rewards over time.

Oracle

The Umbria Network bridge oracle is tasked with determining the finality of transactions on the underlying networks' blockchain and taking action to send users' funds to their chosen destination network from the liquidity pools.

The bridge oracle is a partly-on-chain, partly-off-chain application that monitors activity on supported cryptocurrency networks by interfacing directly with multiple blockchain network nodes. The oracle can detect bridge transactions as they are confirmed on the underlying network's blockchain, and action the necessary subsequent transactions to complete the user's asset migration to the destination network.

The oracle inherits the cryptographic security of the underlying blockchain network, as a consequence of listening exclusively to network activity and honouring the underlying network's consensus mechanisms. It cannot be triggered externally and has no direct interface with users. The security of the bridge oracle is a consequence of its stand-alone architecture. The oracle does not accept messages from outside users, it simply watches transactions arrive on the cryptocurrency networks and takes the appropriate action to finalise the bridging transaction. The oracle is able to infer which network the user intends to bridge to, by noting the wallet address that received the asset. Transactions broadcasted by the oracle are final, due to the immutable nature of the blockchain.

The oracle is designed in such a way that it can be upgraded, maintained or shut down in the event of an emergency. Due to its partially off-chain nature, its configuration and deployment across time are extremely flexible.

The bridge oracle is extremely robust against malicious attack for two reasons:

- a) It does not need to accept messages from anywhere except the trusted underlying network nodes.
- b) The Oracle can operate from a secret location and can be redeployed in a completely new location at any time.

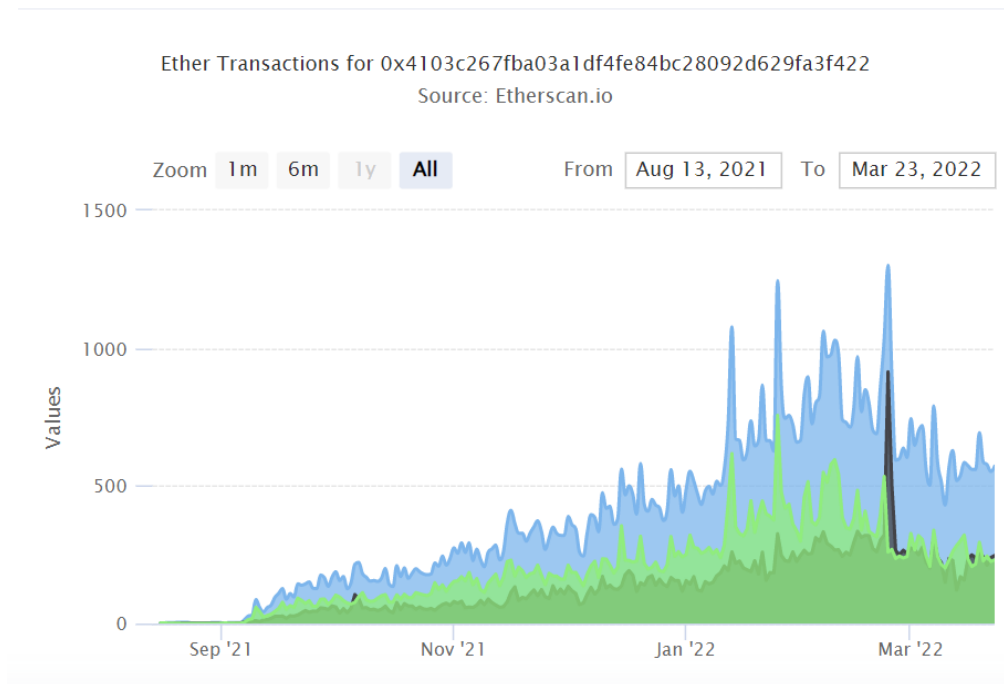
The Increasing Adoption of Layer 2

Layer 2 is quickly becoming the preferred deployment environment for smart-contract-driven dApps, due to its superior cost, scalability and transaction throughput compared to the Ethereum Network. The shift away from the Ethereum Network is a direct consequence of its extreme periods of congestion when there is high interest and demand for transaction throughput.

As dApps gain further mainstream popularity, the Ethereum Network will suffer ever-worsening network congestion, and the ability to shift dApp logic to Layer 2 will become increasingly important. As a consequence of further adoption of Layer 2, the demand for low-cost, high-speed cross-chain bridges will also increase. The Umbria Network bridge is currently the cheapest and fastest bridging protocol for migrating assets between the Ethereum Mainnet and Layer 2 and hence has an excellent chance of becoming the preferred solution. The Polygon PoS Chain has facilitated the first wave of adoption for Layer 2 technology, and the Umbria bridge has seen a steady increase in usage since its deployment in September 2021.

Time Series: Ethereum Transactions

Mon 16, Aug 2021 - Wed 23, Mar 2022



■ Number of Daily Transactions ■ Unique Outgoing Addresses ■ Unique Incoming Addresses

Expanding to Many Networks

The Umbria Network bridge is designed in a way such that it is extensible to any number of cryptocurrency networks regardless of their implementation. The first set of networks supported by the bridge are EVM compatible networks, which all follow the same underlying computational architecture. Once all useful EVM networks are supported, the Umbria Network Bridge will expand its compatibility layer and begin providing support for more networks with less standard implementations.

The Umbria Network bridge currently supports bridging the following assets on the following networks:

	UMBR	MATIC	ETH	USDT	USDC	WBTC	GHST
Polygon Pos Chain	✓	✓	✓	✓	✓	✓	✓
Ethereum Mainnet	✓	✓	✓	✓	✓	✓	✓
Binance Smart Chain			✓				
Avalanche			✓				
Fantom			✓				

Umbria Network recognises that different networks have distinct use-cases, and that many dApps of different shapes and sizes will be deployed on the networks that best-suit their particular requirements. The Umbria Network bridge is engineered such that it does not favour any particular network design, and can adapt to unforeseen changes in network requirements that may become apparent in the future, due to its upgradable nature.

Umbria can therefore be considered as a compatibility layer, first and foremost, in the sense that it simply serves as a message-transport system for transactions between incommunicable cryptocurrency networks. With that in mind, Umbria is not restricted by the network design of the networks it supports. Rather it is only constrained by the amount of available liquidity on that particular network.

Tokenomics

Umbria Network has a governance token called UMBR. UMBR can be staked in the Umbria Network bridge to earn a 60% portion of all fee rewards generated by the bridge across time.

The UMBR token can be earned directly by farming UNiv2 UMBR-ETH LP tokens, in the Umbria farm. Liquidity providers receive Univ2 UMBR-ETH LP tokens by lending UMBR and ETH liquidity to the UMBR-ETH trading pair on Uniswap. Liquidity providers can stake the LP tokens in the Umbria farm to earn UMBR every block. LP stakers earn a proportionate share of 1 UMBR per minute. The farm will cease paying UMBR approximately 3 years after its launch.

There will be a maximum of 10,000,000 UMBR tokens spanning across all networks, starting with the Ethereum Mainnet and Polygon PoS Chain.

The Umbria DAO stakes a portion of its pre-minted tokens in the bridge to fund development and buy more UMBR tokens from time to time. The DAO generates revenue as a function of bridging volume. As bridge volume increases, and more chains are added UMBR stakers earn a greater volume of fees.

Maximum Supply	10,000,000
Token Premint	2,000,000
Farm Emission Schedule	1 UMBR / minute
Token Mappings	Ethereum Mainnet ↔ Polygon PoS Chain
Ethereum Contract Address	0xa4bbe66f151b22b167127c770016b15ff97dd35c
Polygon Contract Address	0x2e4b0fb46a46c90cb410fe676f24e466753b469f