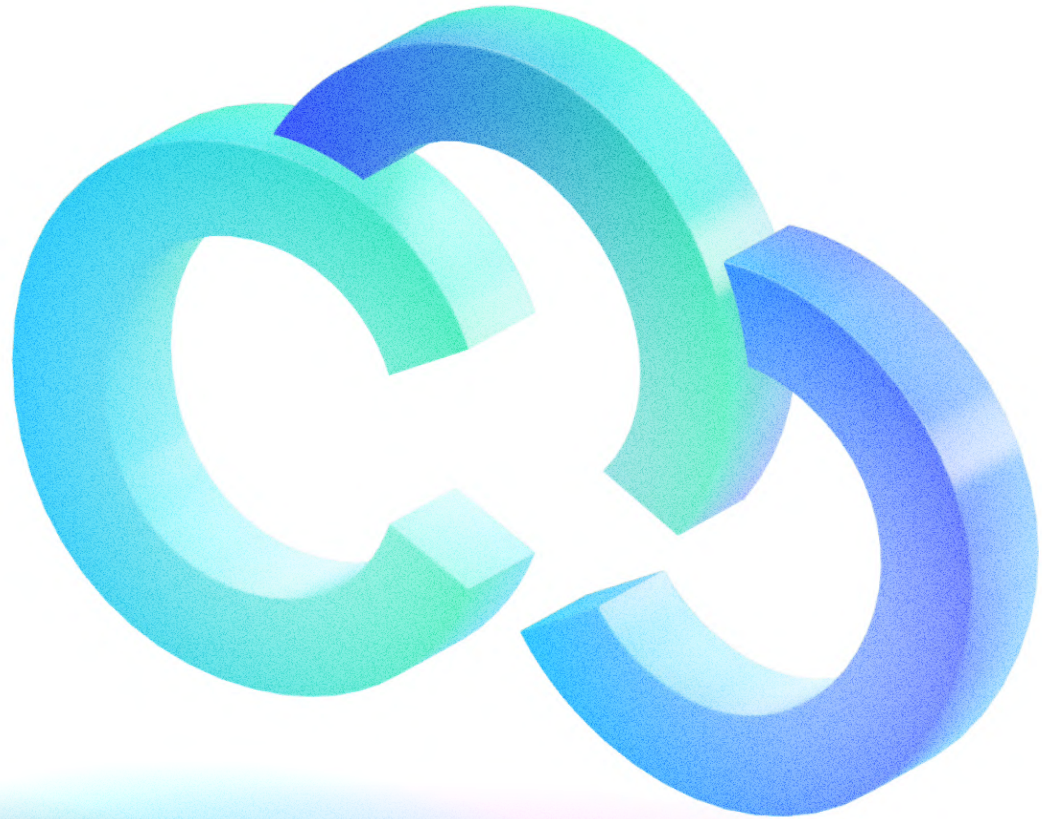


cycle

Ethereum-Backed Storage DePIN

with Native Privacy and Programmable Data Ownership

Litepaper v1

Cycle is a next-generation decentralized storage network (DePIN) designed to meet institutional requirements for secure, scalable, flexible, and private data management with programmable disclosure.

The solution is built upon an advanced Layer-2 infrastructure leveraging EigenDA, a Pinning-as-a-Service (PaaS) AVS that enhances IPFS with a crypto-economic incentive model, and a native integration with Threshold Network's TACo (Threshold Access Control) to provide cutting-edge privacy capabilities — all secured by Ethereum via Eigen Layer.

Powered by the $CYCLE token that underpins transactions, service payments, staking, and reward distribution, Cycle addresses critical gaps in interoperability, security, and privacy. It offers a unified platform for institutions and developers, overcoming limitations found in existing storage solutions such as Filecoin, Arweave, and Storj.

Origins and Market Gap Identification

Meeting the Evolving Needs of Institutional Actors in Web3 Storage.

Founded in 2017, Arianee has been at the forefront of enabling institutions to attach digital data to real world products (RWP), enabling use cases such as tokenization, seamless resale capabilities, circularity, and loyalty programs. Over the years, globally recognized brands such as **Audemars Piguet**, **Breitling**, **Fnac Darty**, and **Lacoste**, among others, have integrated Arianee's open-source into their ITs and operations to unlock the full potential of Web3.

Addressing the Gap: Unified Programmable Data Ownership with Modular Storage Policies and Native Privacy

Through close collaboration with these players, we identified a persistent challenge: the lack of a **unified, interoperable solution for securely storing, decentralizing, and programmably sharing data** with trusted commercial partners, regulators, or other data stakeholders.

The solution needed to go beyond basic storage to enable programmable ownership and dynamic, condition-based access while ensuring seamless integration with Ethereum's broader infrastructure, spanning both Layer-1 and Layer-2 networks such as Arbitrum, Base, and Optimism.

Existing solutions such as **IPFS** and **Filecoin** provide foundational technologies for decentralized storage but lack this critical integration, leaving them siloed within their own economies, less secure, and fundamentally incompatible with smart contracts deployed across Ethereum's expansive ecosystem.

> *In short, what the market demands is an **all-in-one solution** that enables data storage with configurable storage policies (e.g., restricting hosting to whitelisted institutional-grade providers or allowing broader participation), a timestamping and customizable data enrichment layer with L1 security, programmable data ownership capabilities fully integrated with Ethereum's ecosystem and native privacy enabled by robust threshold encryption mechanisms.*

Introducing Cycle: DePIN Storage Network

w/ Privacy secured by Ethereum

Today, we are proud to introduce Cycle, a groundbreaking solution designed to address the real-world challenges faced by our clients, as outlined earlier.

Cycle leverages advanced technologies to revolutionize data storage, security, and sharing within Web3 and among traditional institutions. Beyond addressing these client needs, Cycle's innovative architecture opens the door to a wide range of applications across various industries and technologies.

From decentralized memory frameworks for AI agents, where encrypted data can be stored and accessed on demand, to environments requiring long-term, trustless data retention, Cycle empowers any kind of entity to securely share and manage data with unknown or dynamic participants.

It consists of three core components that work seamlessly together to deliver unmatched functionality and innovation.

1

Cycle Rollup:

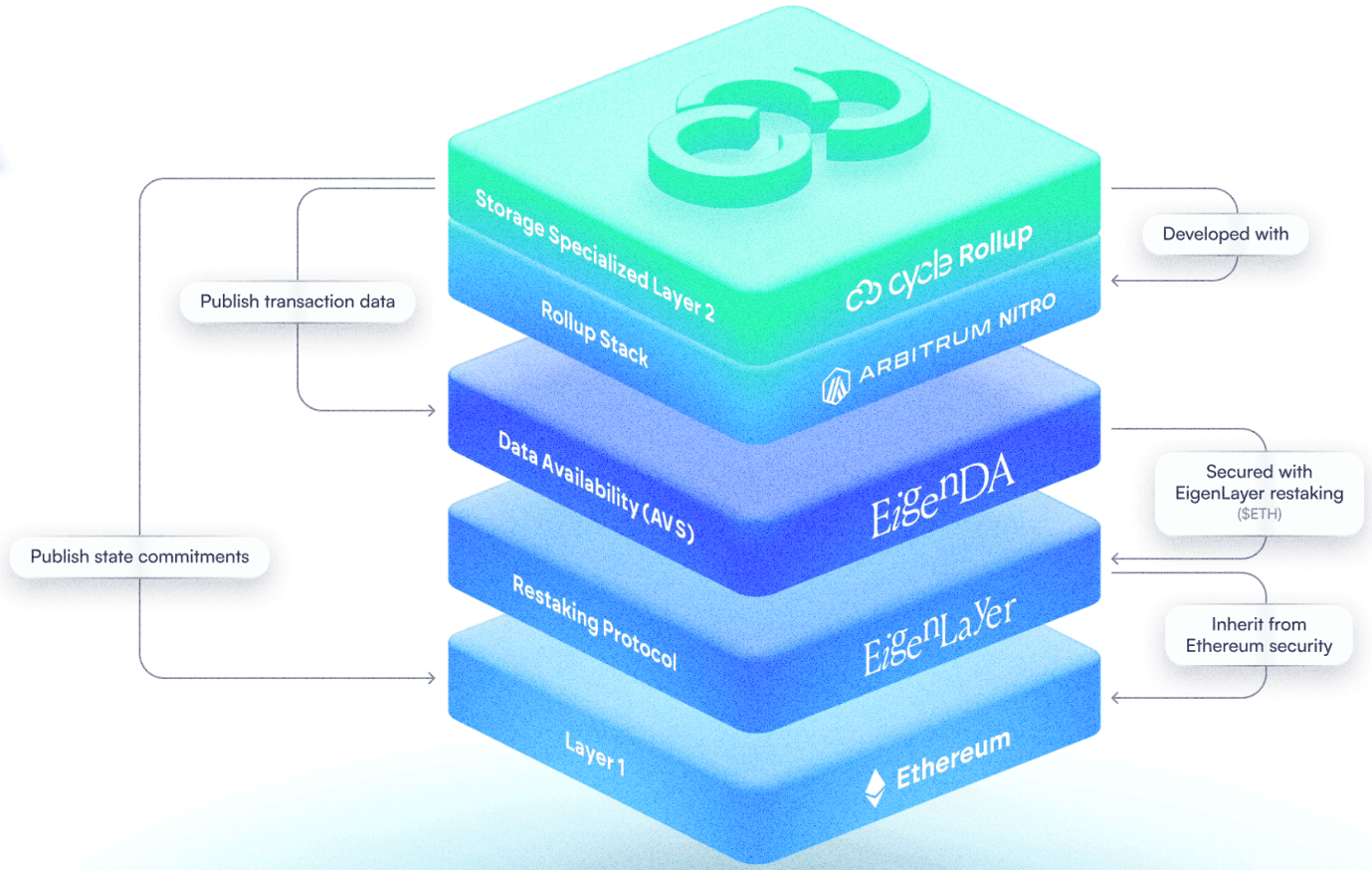
Timestamping and Economic Layer

The Cycle Rollup is the backbone of Cycle's Layer-2 infrastructure, delivering a programmable timestamping and economic layer that supports the entire ecosystem.

Developed with the Arbitrum Nitro stack, it commits directly to Ethereum to ensure enhanced security and transparency while leveraging EigenDA as the data availability solution to achieve cost-efficient operations without compromising Ethereum-grade security.

The Rollup serves as a vital coordination layer for the Pinning-as-a-Service AVS component and Threshold Network's TACo, facilitating consensus between nodes, maintaining state consistency, and enabling efficient payment collection.

Additionally, it empowers Cycle users to deploy smart contracts that gate access to data based on programmable conditions. These contracts range from straightforward access rules to sophisticated protocols (e.g., the Arianee Protocol), providing dynamic, condition-based control over data interactions.



Cycle Rollup

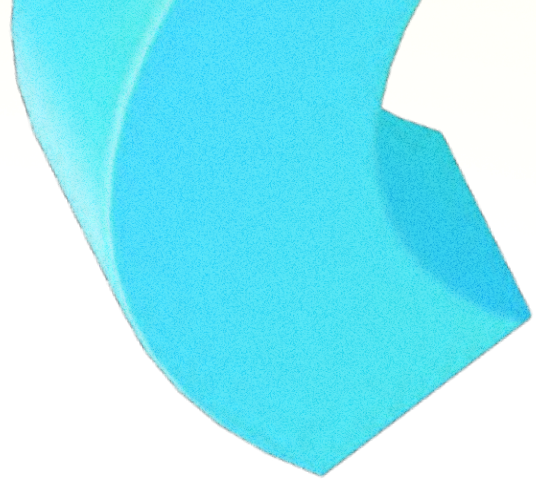
The Cycle Rollup serves as the foundational Layer 2 infrastructure built on Ethereum. It provides a programmable timestamping and economic layer for the Cycle ecosystem.

Key Takeways:

Commits directly to Ethereum Layer 1 for enhanced security and transparency.

Leverages EigenDA for cost-efficient data availability while maintaining Ethereum-grade security.

Acts as a coordination layer for the AVS component (PaaS) and Threshold Network's TACo, as well as the economic layer for processing service payments.



2

Cycle Pinning-as-a-Service (PaaS) AVS:

Persistent and Incentivized Storage

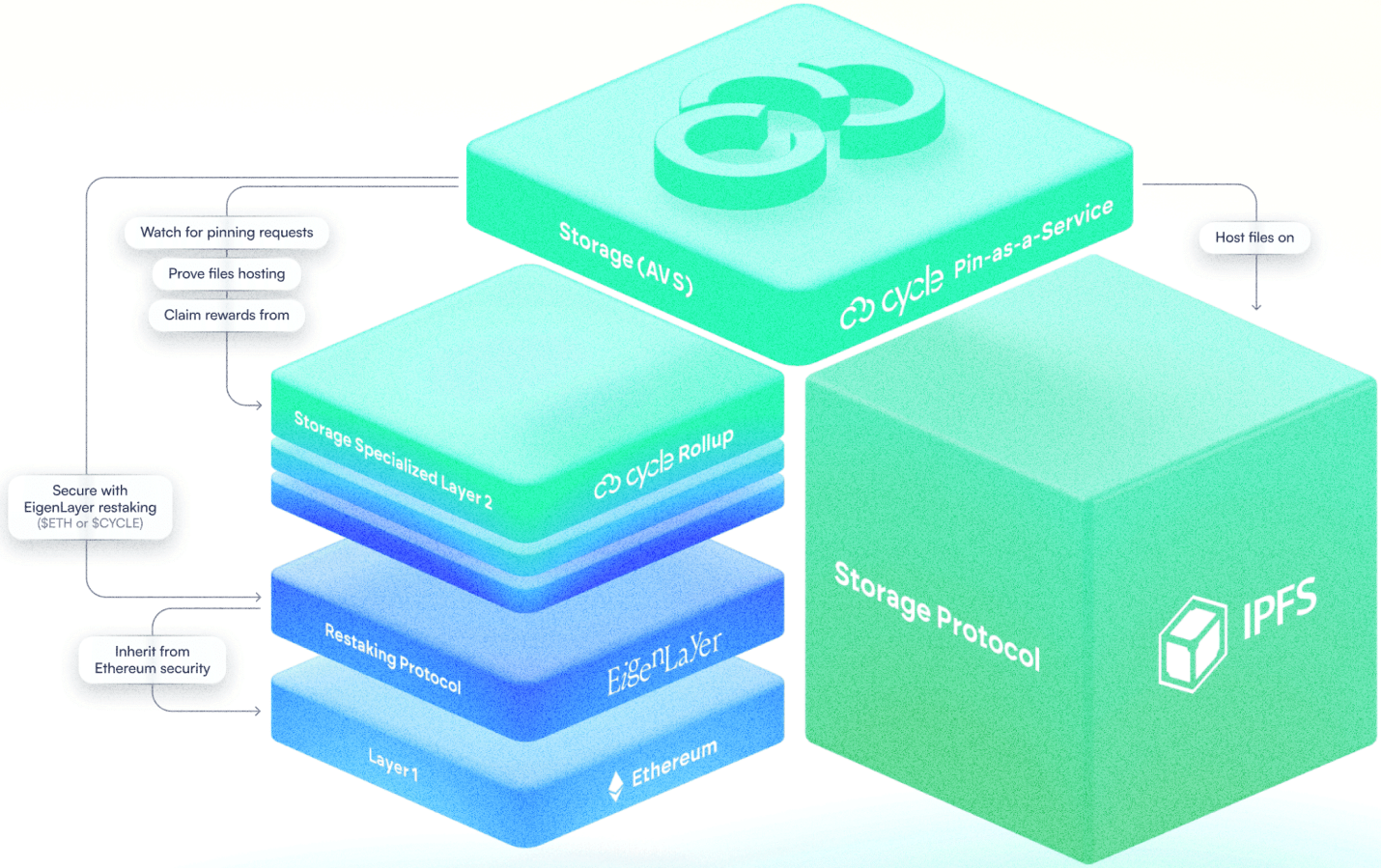
The second component of Cycle is an AVS designed specifically for Pinning-as-a-Service (PaaS).

This AVS leverages the well-established IPFS protocol to provide decentralized file storage but enhances it with an economic incentive model that encourages active participation from storage operators.

Operators must provide regular cryptographic Storage Proofs to confirm that files remain stored and accessible, ensuring storage reliability. In cases where operators fail to meet this requirement, they face slashing penalties, ensuring the reliability and accountability of the network. Cycle's PaaS represents the first decentralized storage network fully backed by Ethereum's security and deeply aligned with its ecosystem.

Furthermore, institutions can customize their storage policies when making a pinning request to align with specific requirements. Options include hosting through whitelisted, institutional-grade providers for enhanced compliance or enabling broader decentralized participation for increased flexibility.

> *An Actively Validated Service (AVS) is a decentralized infrastructure introduced by EigenLayer, designed to provide secure and reliable operations by leveraging Ethereum's security model. Operators in an AVS are required to stake assets (mainly ETH), ensuring alignment of their incentives with the integrity of the network. This framework enforces trust and accountability through a robust slashing mechanism for underperformance or malicious behavior.*



Cycle Pinning-as-a-Service

Provides decentralized file storage by enhancing the IPFS protocol with an Ethereum-aligned economic incentive system.

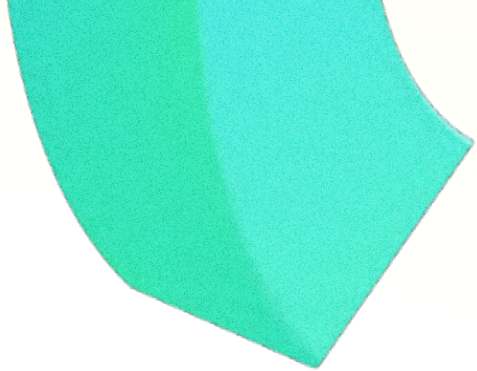
Key Takeways:

Operators stake $ETH or $CYCLE as collateral to guarantee reliable pinning operations.

Publishes optional metadata about pinned files during pinning requests, leveraging Cycle Rollup's timestamping and metadata enrichment.

Files are secured with cryptographic Storage Proofs posted on-chain, ensuring availability and reliability. Non-compliance results in slashing penalties.

Reads and interacts with Storage Policy smart-contracts via the Rollup, which orchestrates hosting rules and enables operators to periodically claim rewards.



3

Cycle x Threshold Network:

Native Privacy and Programmable Access Control w/ TACo

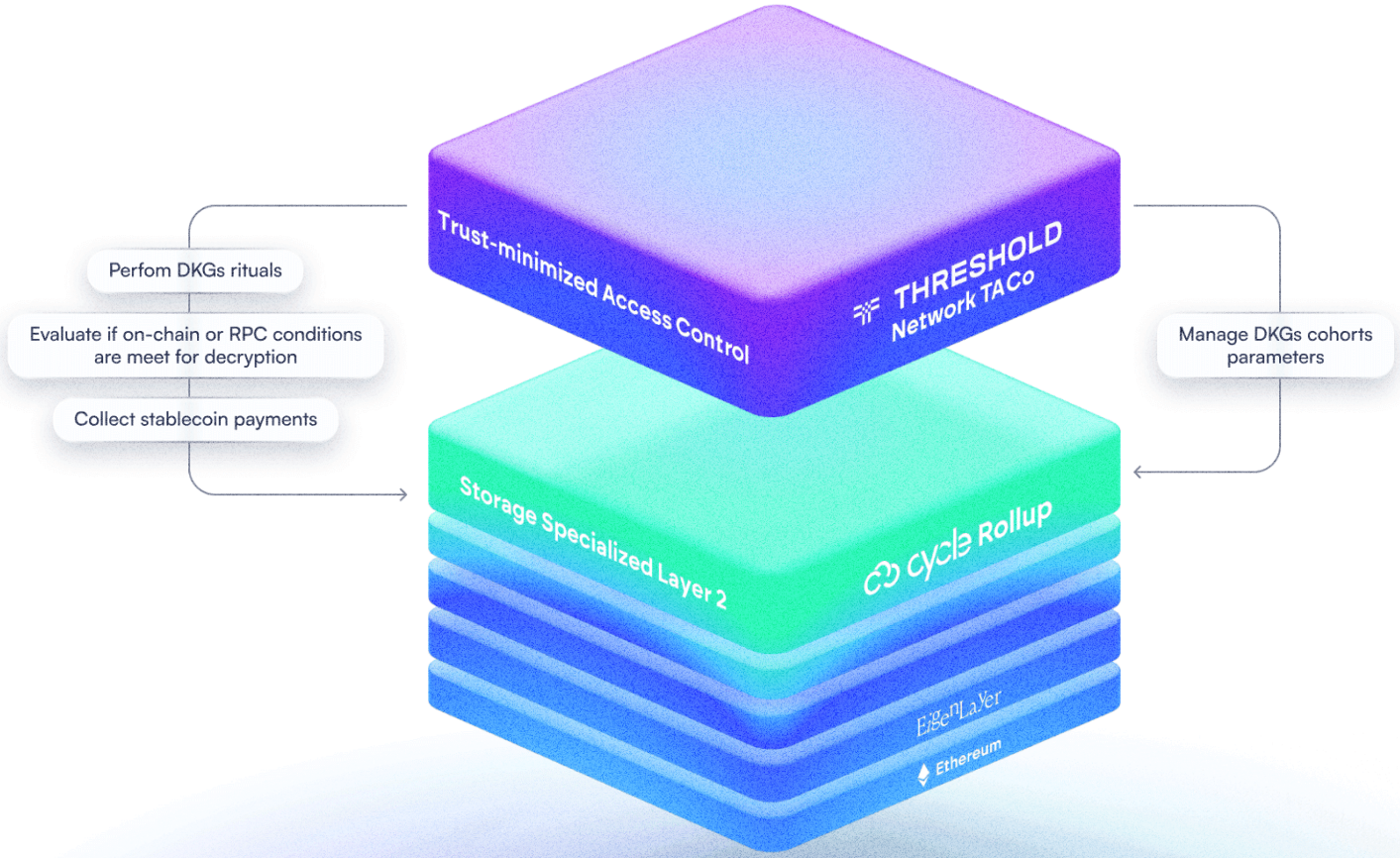
The final component of Cycle is its native integration with Threshold Network's TACo (Threshold Access Control), a cutting-edge solution for ensuring native privacy and enabling programmable access control for encrypted data.

TACo empowers Cycle users to encrypt their data client-side, leveraging the most decentralized threshold encryption network. Encryption key shares are distributed across a customizable DKG (Distributed Key Generation) cohort, ensuring that data can only be decrypted by a quorum of participating nodes that verify access conditions. This architecture eliminates vulnerabilities tied to centralized systems and ensures unprecedented security.

TACo allows access to encrypted data to be gated by a wide array of programmable conditions. These include on-chain ownership of an asset (ERC-20, ERC-721, etc.,), RPC triggers, time-based events, or any other custom logic defined through smart contracts.

Furthermore, it supports off-chain conditions, such as Web Proofs that are handled through VLayer, which bridges real-world verifications directly into blockchain logic. This innovative system introduces the concept of Programmable Data Ownership, allowing encrypted content to be accessed dynamically based on predefined conditions.

Seamlessly integrated with the Cycle Rollup, TACo handles critical processes such as DKG rituals, enforcing decryption conditions, and processing payments. This partnership creates a powerful framework for privacy-preserving, condition-based data access, fully interoperable with Ethereum's ecosystem and designed to meet diverse institutional and individual user needs.



Cycle x Threshold Network TACo

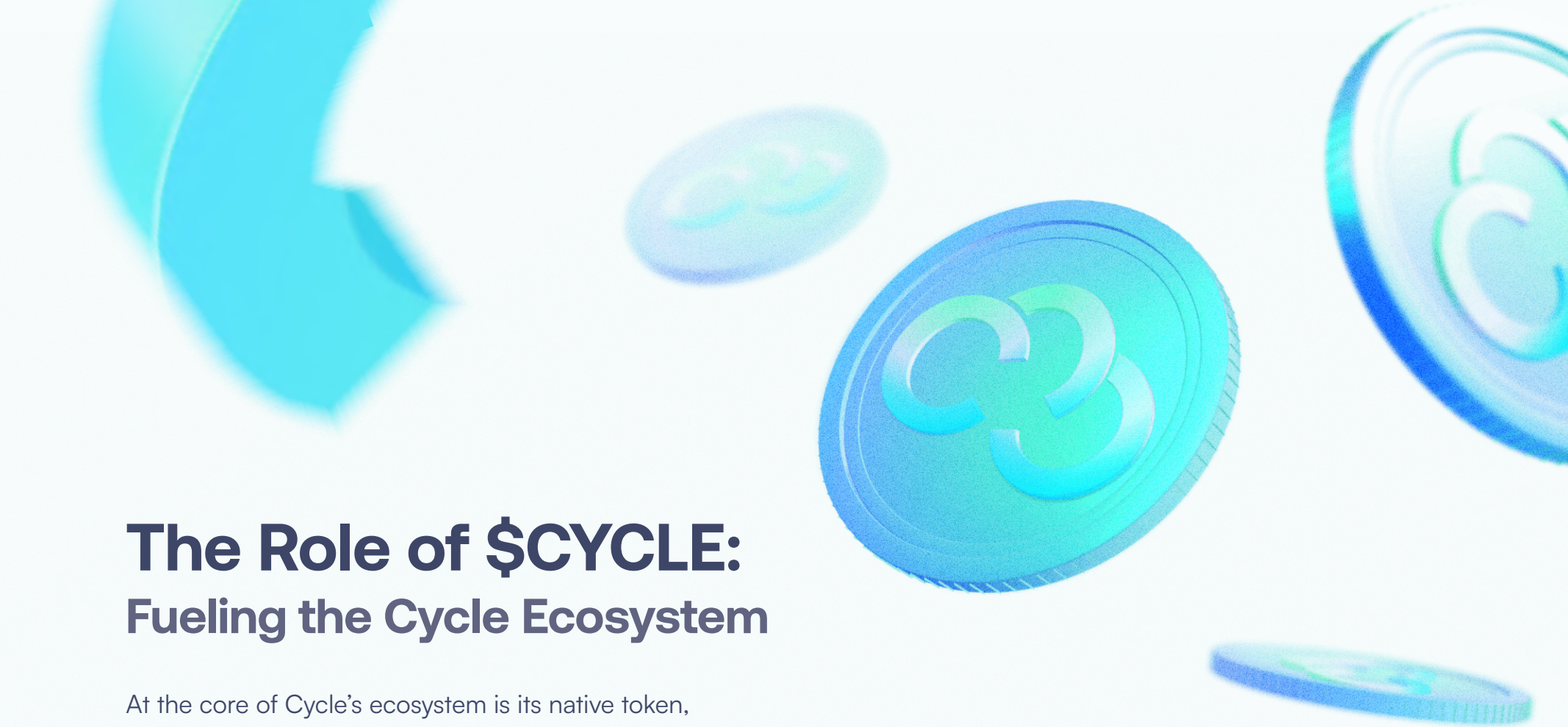
Ensures native privacy and enables programmable access control for encrypted data through the most decentralized threshold encryption network.

Key Takeways:

Allow to encrypt data against a distributed (and customizable) DKG cohort than can be shared between encryptors if needed.

Allows data access to be gated by a wide range of conditions, such as on-chain ownership, RPC triggers, time-based events, or any custom logic via smart-contracts.

Integrates with Cycle Rollup's for DKG rituals, decryption conditions, and payment processing.



The Role of $CYCLE:
Fueling the Cycle Ecosystem

At the core of Cycle's ecosystem is its native token, $CYCLE, which serves multiple purposes to ensure seamless functionality and economic alignment:

Native Gas Token: $CYCLE is used for all transactions on Cycle's Layer 2 infrastructure, enabling efficient and low-cost operations.

Services Payment: Payments for built-in services, such as the Pinning-as-a-Service and TACo (Threshold Access Control), are made in $CYCLE. For institutional clients, payments can also be made in stablecoins, which are auto-converted into $CYCLE for system consistency.

Collateral for Staking: AVS operators can stake $CYCLE alongside ETH as collateral to enhance network security and align incentives.

Reward Distribution: All rewards distributed to AVS operators for their services are issued in $CYCLE, creating a self-sustaining economic ecosystem.layer with L1 security, programmable data ownership capabilities fully integrated with Ethereum's ecosystem and native privacy enabled by robust threshold encryption mechanisms.

Positioning Cycle:
Innovation in a Billion-Dollar Market

Cycle competes in a growing DePIN market alongside established players such as Filecoin, Arweave, and Storj, within an industry projected to exceed $15 billion by 2030.

This demand is fueled by the increasing need for secure, scalable, and privacy-focused solutions in Web3. While these competitors have made significant strides, they fall short in key areas.

For example, Filecoin specializes in decentralized storage but lacks integration with Ethereum's smart contract ecosystem, limiting its programmability and institutional compatibility.

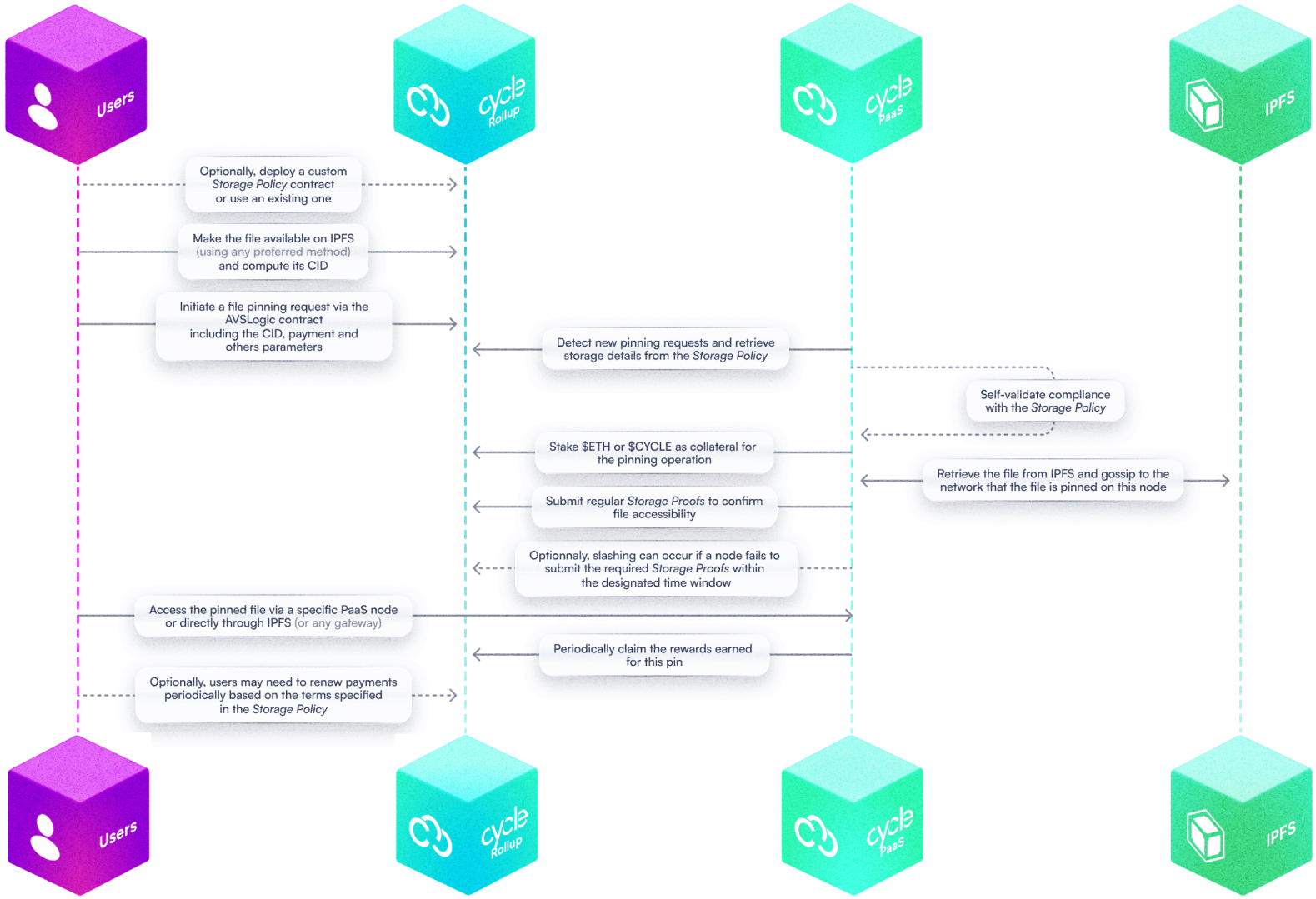
Arweave provides permanent storage but incurs high costs and reduced flexibility, while Storj operates within a proprietary ecosystem, restricting its adaptability for Web3 use cases.

Cycle offers a unique edge by delivering a fully Ethereum-aligned solution that combines decentralized storage, programmable data ownership, and native privacy into one unified platform.

Leveraging IPFS and enhanced with an economic incentive model rooted in Ethereum's security, Cycle delivers unparalleled reliability and scalability, with TACo adding dynamic, condition-based data management capabilities.

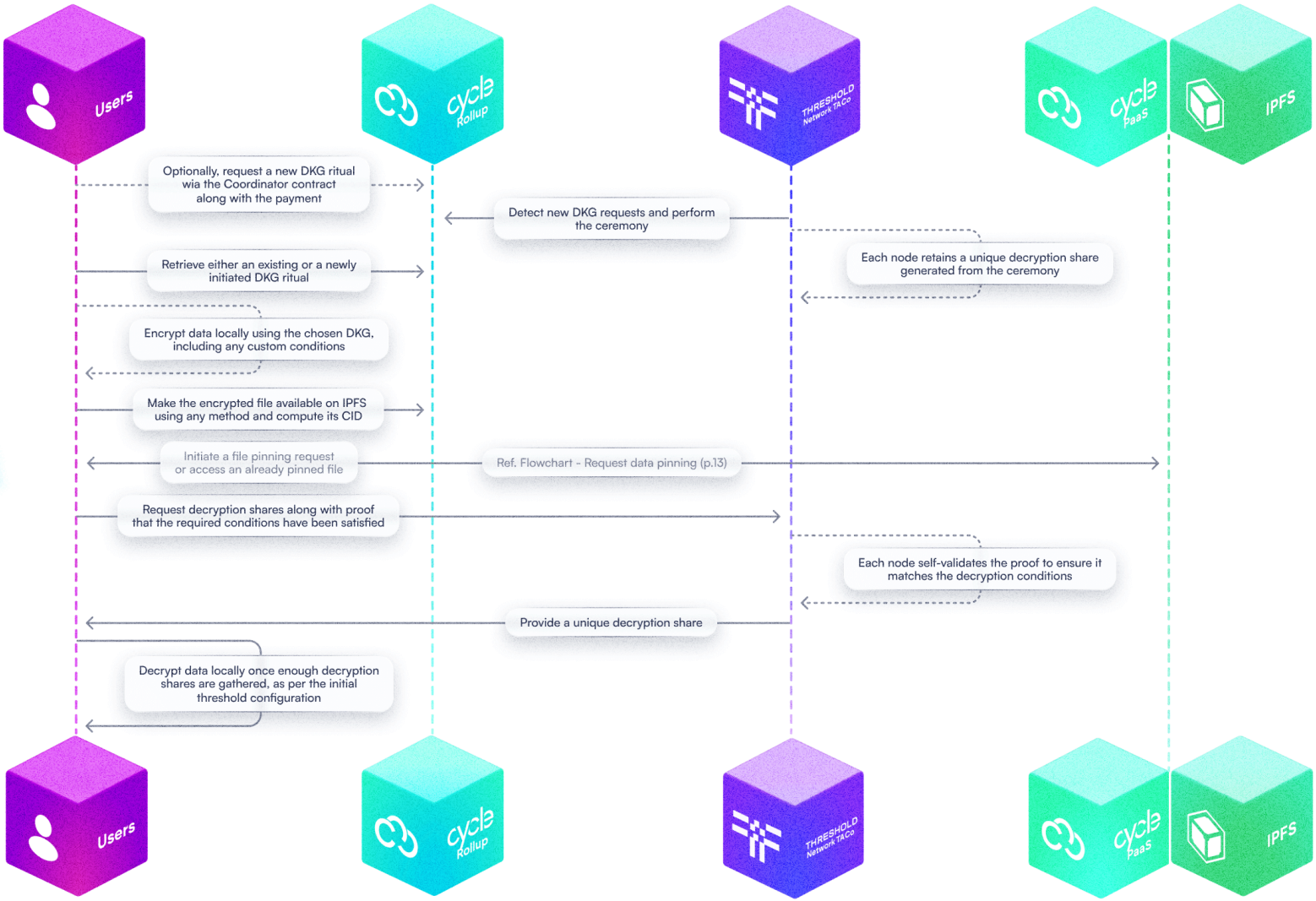
Cycle Usage Flowcharts

Request data pinning then access it



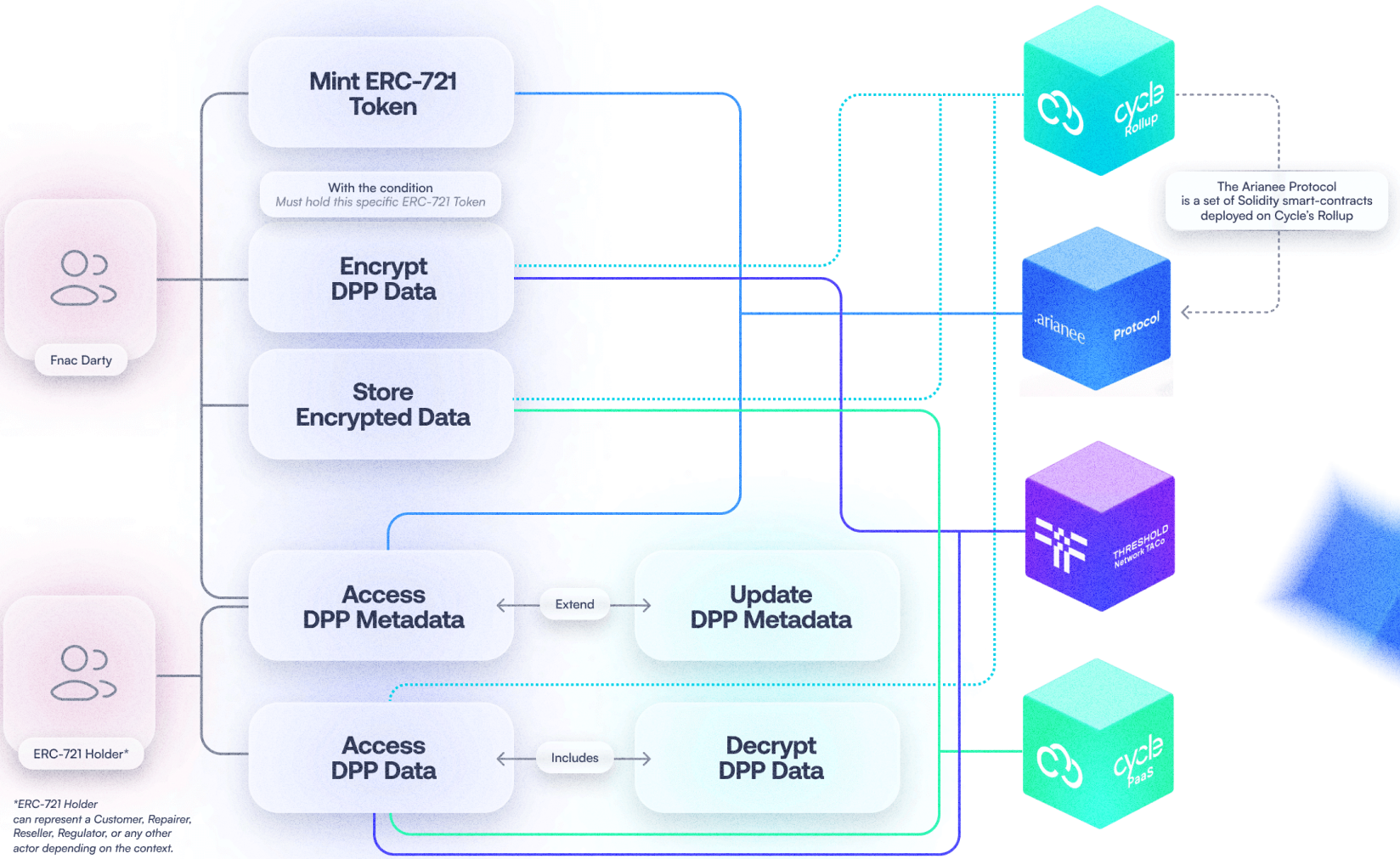
Cycle Usage Flowcharts

Request DKG, encrypt data w/ decryption conditions then access it



Cycle Use-Case Diagrams

System Boundary: Cycle Digital Product Passport System



Cycle Use-Case Diagrams

Harnessing Cycle for AI Agents: A Decentralized Memory Framework