Layer 3 XCN Ledger

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Abstract

Onyx is a Layer 3 blockchain designed to enhance scalability, interoperability, and economic efficiency by leveraging Arbitrum Orbit's rollup technology, AnyTrust's data availability model, and Base Layer 2 for settlement. By optimizing transaction throughput while maintaining Ethereum's security guarantees, Onyx serves as a high-performance execution layer for decentralized applications (DApps), financial systems, and enterprise adoption. Built on Arbitrum Nitro, Onyx ensures full EVM compatibility while benefiting from advanced compression techniques and fraud-proof validation. The network implements EIP-1559 to introduce a predictable gas fee model including onchain burns, with XCN as its native gas token, enabling transaction execution, staking, and decentralized governance through the Onyx DAO.

1. Introduction.

1.1 Onyx: The Layer 3 XCN Ledger.

Onyx represents the next stage in blockchain evolution, positioning itself as a premier Layer 3 protocol that redefines scalability, security, and interoperability. Built on Arbitrum Orbit[1], Onyx leverages rollup technology to enable high-speed, low-cost transactions while maintaining the decentralized security of the Ethereum ecosystem. This advanced infrastructure is complemented by Coinbase's Base Layer 2 blockchain[2], which serves as the settlement layer, providing an additional level of economic security and operational efficiency. Designed with enterprise adoption in mind, Onyx supports a diverse range of applications, including institutional financial services, decentralized applications (DApps), decentralized finance (DeFi) protocols, and large-scale blockchain enterprise solutions. By integrating Arbitrum's rollup technology and AnyTrust's optimized data availability protocol, Onyx establishes a comprehensive framework that balances performance, security, and decentralization, ensuring seamless execution and robust network integrity.

One of Onyx's core advantages is its ability to optimize scalability without compromising decentralization. Traditional Layer 1 networks such as Ethereum, while highly secure and decentralized, face challenges related to network congestion, high gas fees, and limited throughput. While Layer 2 solutions like Arbitrum and Base address these issues by executing transactions off-chain before settling them on the Ethereum mainnet, they remain constrained by a shared, generalized execution environment. Onyx's Layer 3 architecture enhances these capabilities by providing a customizable execution layer tailored for high-performance financial and enterprise applications. By offering dedicated rollups that cater to specific use cases, Onyx allows institutions and developers to deploy bespoke blockchain solutions with fine-tuned security parameters, gas fee optimizations, and governance mechanisms, all while leveraging the Ethereum trust model.

Beyond scalability, Onyx introduces an economic model centered around the Onyxcoin ("XCN") token, which serves as the native gas token for network transactions and smart contract execution. XCN is also fundamental to Onyx's staking and governance mechanisms, reinforcing the decentralized nature of the ecosystem through Onyx DAO, a community-driven governance framework. By allowing token holders to participate in protocol decision-making, Onyx ensures that its evolution remains aligned with the needs of its users and stakeholders. Additionally, XCN's role in security and incentivization fosters sustainable network growth, encouraging developer participation and institutional adoption. With its next-generation Layer 3 infrastructure, advanced governance model, and seamless interoperability, Onyx is positioned to lead the Layer 3 space in ushering in an era of institutional-grade decentralized solutions that prioritize efficiency, security, and adaptability.

1.2 A Purpose-Built Layer 3 Blockchain.

Unlike conventional blockchain networks that operate solely on Layer 1 or Layer 2 architectures, Onyx redefines blockchain efficiency by leveraging a Layer 3 model that enables the creation of specialized, application-specific environments. While Layer 1 blockchains like Ethereum provide the foundational security and decentralization, they often suffer from high gas fees, network congestion, and throughput limitations. Layer 2 solutions such as Arbitrum and Base help mitigate these constraints by executing transactions off-chain before settling them on the Ethereum mainnet. However, Layer 3 networks like Onyx go beyond simple scalability enhancements, offering an adaptive and interoperable environment optimized for institutional-grade applications.

Onyx's Layer 3 architecture introduces a modular approach to blockchain infrastructure, allowing developers and enterprises to deploy customized rollup chain* tailored to their specific needs. This modularity ensures that applications can operate independently while still benefiting from the security and liquidity of Ethereum's broader ecosystem. By offering dedicated execution environments, Onyx reduces congestion and optimizes transaction processing efficiency, making it a superior choice for high-performance applications such as institutional finance, real-world asset tokenization, and large-scale DeFi platforms. Onyx enhances cross-chain interoperability, enabling seamless communication between multiple blockchain networks and fostering a more connected and accessible decentralized ecosystem. Through its flexible design, developers can implement application-specific governance models, select their preferred consensus mechanisms, and fine-tune network parameters to align with their strategic objectives. This approach not only increases developer autonomy but also strengthens the scalability, efficiency, and accessibility of blockchain technology, making Onyx a key driver in the advancement of next-generation decentralized applications and financial solutions.

1.3 XCN: The Economic and Governance Backbone.

The core digital currency within the Onyx network is Onyxcoin (XCN), the native gas token and governance asset of the protocol. XCN serves multiple key roles within the ecosystem:

- **Transaction Settlement**: XCN is used to pay for transaction fees, ensuring a seamless and cost-effective user experience both off and onchain.
- Smart Contract Execution: Developers leverage XCN for executing smart contracts within the Onyx ecosystem.
- **Payments and Incentives**: XCN is used as a medium of exchange within the network, supporting various use cases across financial and DeFi applications.
- **Economic Security via Staking**: XCN holders can stake their tokens to participate in securing the network and earn rewards.

- **Decentralized Governance**: Through the Onyx Decentralized Autonomous Organization (DAO), XCN holders influence protocol upgrades, governance decisions, and ecosystem developments.

This decentralized governance model ensures that Onyx remains community-driven, self-sustainable, and adaptable to evolving market demands.

1.4 Arbitrum Orbit: The Scalability and Customization Engine.

The decision to build Onyx on Arbitrum Orbit stems from its ability to provide customizable Layer 3 rollups with unparalleled scalability, cost efficiency, and adaptability. Unlike generalized Layer 1 and Layer 2 solutions, Arbitrum Orbit allows for the creation of bespoke blockchain networks tailored to the specific needs of institutions, enterprises, and developers. By offering a flexible and modular approach, Onyx benefits from a high-performance framework that supports specialized execution environments, optimized consensus mechanisms, and dynamic governance structures. This enables developers to deploy application-specific rollups without the constraints typically associated with monolithic blockchain architectures.

A core strength of Arbitrum Orbit is its ability to maintain Ethereum's security guarantees while significantly reducing transaction costs and network congestion. By utilizing AnyTrust's Data Availability Committee (DAC), Onyx ensures that off-chain transaction data remains verifiable and accessible in a trust-minimized manner, reducing the reliance on Ethereum's mainnet for data availability. This approach not only enhances network efficiency and cost-effectiveness but also enables institutions to conduct high-frequency transactions without incurring excessive fees or delays. Additionally, the integration of AnyTrust's DAC enhances the security model by preventing data withholding and ensuring reliable data retrieval for validators and users alike.

Beyond scalability and cost reduction, Arbitrum Orbit empowers Onyx with extensive customization capabilities. Developers can fine-tune network parameters, implement application-specific gas fee structures, and even introduce unique governance models that align with their operational requirements. This level of granular control makes Onyx an attractive solution for enterprises seeking highly optimized blockchain networks tailored to finance, real-world asset tokenization, gaming, and other high-performance applications. The ability to deploy dedicated execution environments ensures that applications built on Onyx do not suffer from congestion or resource contention, providing a stable and predictable blockchain infrastructure for mission-critical use cases.

Arbitrum Orbit enhances Onyx's interoperability by facilitating seamless cross-chain interactions with Ethereum and other Layer 2 and Layer 3 networks. This interoperability allows Onyx-based applications to access liquidity, smart contract functionalities, and ecosystem integrations across multiple chains, unlocking new possibilities for developers and users. By supporting interoperable

rollups and cross-chain messaging protocols, Onyx fosters a connected blockchain landscape that eliminates silos and enhances overall efficiency.

By leveraging Arbitrum Orbit's advanced scaling solutions, modular architecture, and seamless Ethereum compatibility, Onyx positions itself as a next-generation Layer 3 protocol that delivers unparalleled performance, security, and flexibility. This strategic integration not only reinforces Onyx's commitment to scalability and efficiency but also ensures that it remains at the forefront of blockchain innovation, providing developers and enterprises with the tools they need to build the decentralized applications of the future.

1.5 Coinbase's Base: The Economic Security Layer.

To reinforce Onyx's economic and security foundation, Coinbase's Base Layer 2 blockchain serves as a settlement and economic security layer, providing a robust and efficient infrastructure that complements Onyx's Layer 3 architecture. Built on the OP Stack, Base is specifically designed to offer high scalability, low transaction costs, and streamlined developer accessibility, making it an ideal foundation for secure and scalable decentralized applications (DApps). Onyx leverages Base's deep integration with Ethereum to ensure seamless interoperability, allowing assets and smart contracts to move fluidly across different blockchain environments. This integration reduces friction, optimizes gas fees, and enhances transaction finality, ensuring that Onyx remains economically sustainable and highly accessible to both developers and institutional users.

One of the most significant advantages of utilizing Base as Onyx's economic security layer is its ability to provide efficient transaction settlement while maintaining Ethereum's security model. As a Layer 2 blockchain, Base processes transactions off-chain before settling them on Ethereum, ensuring that Onyx-based applications can achieve high throughput and cost-effective execution without compromising on decentralization. This model reduces congestion on Ethereum's mainnet, allowing Onyx users to benefit from fast finality and significantly lower gas costs. Additionally, Base's reliance on Ethereum's trust model ensures that transactions remain verifiable and immutable, reinforcing Onyx's commitment to security and decentralization.

Aside from cost efficiency and scalability, Base enhances Onyx's accessibility and developer experience by offering user-friendly tooling, simplified contract deployment, and native Ethereum compatibility. Developers building on Onyx can seamlessly integrate their applications with Ethereum's liquidity and existing DeFi infrastructure, allowing for a frictionless onboarding experience. This level of developer flexibility and integration makes Onyx a powerful choice for enterprises and institutions seeking to deploy scalable and efficient blockchain applications without the complexity and high costs associated with traditional Layer 1 solutions.

Base's strategic positioning as a Coinbase-backed Layer 2 network provides Onyx with enhanced credibility, institutional trust, and increased adoption potential. By leveraging Base's extensive ecosystem of financial institutions, enterprises, and developers, Onyx can expand its network reach

and attract a wider user base. This symbiotic relationship bridges traditional finance with decentralized blockchain networks, fostering a seamless transition for enterprises looking to integrate Web3 capabilities.

By utilizing Coinbase's Base Layer 2 as its economic security layer, Onyx benefits from high scalability, reduced transaction costs, robust security, and deep Ethereum integration. This strategic alignment ensures that Onyx is well-positioned to drive institutional blockchain adoption, enhance DeFi accessibility, and enable next-generation decentralized applications. With Base's efficient settlement model and Onyx's customizable Layer 3 architecture, the ecosystem is set to provide a high-performance, low-cost, and secure blockchain infrastructure that redefines the future of decentralized finance and enterprise blockchain solutions.

1.6 Onyx: Pioneering Institutional Blockchain Adoption.

Onyx is designed to address the complex demands of institutional blockchain adoption by offering a scalable, interoperable, and highly customizable Layer 3 blockchain infrastructure. Traditional Layer 1 and Layer 2 networks, while effective, often struggle to meet the stringent requirements of financial institutions and enterprises due to limitations in scalability, high operational costs, and constrained interoperability. Onyx overcomes these challenges by integrating Ethereum's security, Arbitrum's advanced rollup technology, and Base's economic efficiency, creating a robust and efficient blockchain ecosystem tailored to institutional and enterprise-grade applications. This strategic architecture enables Onyx to deliver an optimal balance of decentralization, security, and efficiency while fostering innovation and large-scale blockchain adoption.

A defining characteristic of Onyx's Layer 3 model is its ability to provide dedicated execution environments, allowing financial institutions and enterprises to deploy blockchain solutions without the congestion and resource competition found on general-purpose Layer 1 and Layer 2 networks. Onyx enables organizations to fine-tune network parameters, optimize gas fee structures, and implement application-specific governance frameworks, making it an attractive option for industries such as banking, asset management, and large-scale DeFi operations. By reducing operational complexity and lowering transaction costs, Onyx empowers businesses to integrate blockchain technology seamlessly into their existing infrastructures while benefiting from the security and decentralization of Ethereum.

<u>Key Advantages of Onyx's Layer 3 Mode:</u>

- Scalability and Performance: Onyx achieves high throughput and minimal transaction costs through the integration of Arbitrum Orbit's rollup framework, ensuring that enterprise-grade applications can function efficiently without delays or excessive fees.
- Security and Economic Stability: By leveraging Ethereum's trust model and Base's settlement layer, Onyx provides a secure and economically sustainable ecosystem. This

ensures that institutional users can transact with confidence, knowing that the network upholds strong security principles.

- Customization and Specialization: Onyx allows developers and enterprises to build highly specialized decentralized applications, offering tailored rollup configurations that optimize transaction execution, governance, and data availability based on individual business needs.
- Interoperability and Cross-Chain Functionality: Onyx fosters seamless communication between blockchain networks, enabling developers to integrate their applications with multiple ecosystems. This enhances liquidity, cross-platform functionality, and adoption potential across the decentralized finance landscape.

With its innovative Layer 3 framework, decentralized governance model, and an economic system driven by XCN, Onyx is set to redefine the landscape of institutional blockchain adoption. By providing a flexible, secure, and scalable blockchain environment, Onyx is paving the way for financial institutions, enterprises, and developers to harness the full potential of decentralized technology while ensuring seamless integration into the broader digital economy.

2. Motivation

2.1 Why Onyx Chose a Layer 3.

Onyx is a Layer 3 blockchain rather than a Layer 1 or Layer 2 network because of the need for higher scalability, customization, and interoperability without compromising security or decentralization. While Layer 1 blockchains provide the foundation for decentralized networks, they often suffer from high transaction fees, network congestion, and slower transaction finality. Layer 2 solutions help alleviate these issues, but they remain constrained by their dependency on Layer 1 networks. Onyx takes this a step further by introducing a dedicated Layer 3 solution that enhances flexibility and efficiency beyond what traditional L1s and L2s can offer.

By leveraging a Layer 3 architecture, Onyx is able to create specialized execution environments tailored to the needs of different applications, ensuring that scalability is achieved without introducing bottlenecks common in general-purpose Layer 1 and Layer 2 networks. This model allows for optimized consensus mechanisms, fine-tuned fee structures, and application-specific governance frameworks, all while maintaining seamless interoperability with Ethereum and other blockchain ecosystems. The ability to provide dedicated rollup environments for enterprises, DeFi protocols, and financial institutions ensures that Onyx can support a broad range of use cases without being hindered by network congestion or escalating costs. Through this approach, Onyx not only improves performance but also fosters innovation by providing developers and enterprises with the flexibility needed to build highly efficient and customized blockchain solutions.

2.2 The Decision to Build Onyx on Arbitrum Orbit and Base.

The decision to construct Onyx on Arbitrum Orbit and Base was driven by the necessity for an infrastructure that delivers unparalleled scalability, security, and economic efficiency while maintaining interoperability with the broader Ethereum ecosystem. The combination of these technologies allows Onyx to optimize transaction throughput, reduce gas fees, and maintain a trust-minimized architecture that is essential for institutional and high-frequency applications. By integrating these frameworks, Onyx effectively eliminates the bottlenecks of traditional Layer 1 and Layer 2 networks, ensuring a customizable, efficient, and future-proof Layer 3 blockchain.

Arbitrum Orbit was selected as the execution layer for Onyx due to its ability to deploy high-performance, application-specific rollups while inheriting the security guarantees of Ethereum. Unlike general-purpose Layer 1 and Layer 2 networks, Arbitrum Orbit enables the creation of tailored Layer 3 chains that optimize network parameters based on the unique requirements of decentralized finance (DeFi), institutional trading, and enterprise blockchain applications. This dedicated execution environment provides significantly higher throughput, lower latency, and improved efficiency compared to traditional smart contract platforms.

A key component of Onyx's integration with Arbitrum Orbit is AnyTrust, Arbitrum's data availability solution, which drastically reduces transaction costs by shifting data storage requirements from Ethereum's mainnet to a more efficient off-chain model. AnyTrust employs a permissioned Data Availability Committee (DAC) that ensures the integrity and accessibility of off-chain transaction data while maintaining decentralization and censorship resistance. This design allows Onyx to operate with ultra-low fees and optimized resource allocation, making it a compelling choice for applications requiring high-speed transaction processing without sacrificing security.

Onyx's integration with Coinbase's Base Layer 2 blockchain is a critical component of its economic security model. Base, built on the OP Stack, provides Onyx with enhanced scalability, deep liquidity access, and robust settlement assurances, ensuring that the network remains stable and economically viable under high transaction volumes. By leveraging Base as a secure and cost-effective Layer 2, Onyx is able to benefit from Ethereum's deep liquidity pools and strong security guarantees while optimizing gas fees and transaction costs for end users.

One of the key advantages of utilizing Base is its tight integration with Ethereum's Layer 1 and Layer 2 ecosystem, which facilitates seamless cross-chain interactions and asset movements. This enhances Onyx's capability to support multi-chain interoperability, allowing developers to build and deploy smart contracts that can interact with multiple blockchain environments without requiring complex bridging mechanisms or trust assumptions. The synergy between Base's economic layer and Arbitrum Orbit's execution framework ensures that Onyx achieves both high transactional efficiency and economic sustainability, a crucial factor in driving long-term adoption and developer engagement.

By utilizing Arbitrum Orbit for execution and Base for economic security, Onyx establishes itself as a highly flexible and robust Layer 3 network that can cater to a wide range of use cases, from institutional finance to large-scale DeFi applications. This dual-layer approach not only enhances the network's scalability and cost efficiency but also ensures that developers have access to a powerful, modular, and easily customizable framework.

2.3 Scalability Without Compromises.

One of the primary motivations behind Onyx's Layer 3 architecture is its ability to achieve ultra-low fees and high throughput without sacrificing security or decentralization. Traditional Layer 1 blockchains, while secure and reliable, often struggle with network congestion and high transaction fees, making them impractical for applications requiring high-frequency transactions. Layer 2 solutions alleviate some of these constraints but still depend on Layer 1 settlement, leading to inherent limitations in cost efficiency and scalability. Onyx overcomes these challenges by leveraging Arbitrum Orbit's advanced rollup technology and the AnyTrust data availability model, creating a streamlined execution environment that significantly reduces both costs and latency.

By incorporating AnyTrust's data availability framework, Onyx ensures that transaction data is stored and retrieved efficiently, avoiding the overhead typically associated with full on-chain data storage. This model enhances scalability by allowing the network to process thousands of transactions per second while maintaining trust-minimized verification. Unlike traditional blockchain architectures, which require extensive computational resources to validate every transaction, Onyx optimizes resource allocation to ensure minimal computational overhead without compromising integrity. This makes Onyx a highly efficient and cost-effective choice for developers looking to deploy high-performance decentralized applications (DApps) that demand low-latency execution and seamless user experiences.

The ability to deliver cost-effective, high-speed transactions positions Onyx as an ideal solution for a diverse range of applications, from DeFi platforms and real-time gaming ecosystems to large-scale enterprise solutions. Developers can build and deploy DApps without the worry of unpredictable gas fees or network congestion, fostering broader adoption and innovation within the blockchain space. Onyx's approach to Layer 3 scalability ensures that as blockchain usage grows, the network remains sustainable and efficient, providing a solid foundation for the next generation of decentralized applications and financial services.

2.4 Customization for Developers.

Onyx's Layer 3 architecture offers developers an unprecedented level of customization by enabling the creation of application-specific rollups tailored to distinct use cases. Unlike Layer 1 blockchains, which operate as generalized environments accommodating a broad range of

applications, Onyx allows developers to fine-tune network parameters, governance models, security configurations, and gas fee structures to align with their project requirements. This capability ensures that applications built on Onyx can achieve higher efficiency, enhanced security, and improved scalability without being subject to the resource constraints of a shared network.

By leveraging dedicated execution environments, Onyx eliminates the contention issues common in monolithic blockchain networks, where multiple applications compete for computational resources. Each DApp can operate within its own isolated environment, ensuring that transaction finality and performance remain stable even during periods of high network activity. This isolation not only improves scalability but also enhances security by reducing the risks of cross-application interference and congestion, making Onyx a preferred solution for developers building mission-critical applications, such as financial services, gaming ecosystems, and enterprise blockchain solutions.

Beyond its structural advantages, Onyx supports flexible governance and modular security frameworks, allowing projects to implement custom consensus mechanisms and validator structures suited to their needs. Developers can optimize economic models to balance decentralization and efficiency, ensuring sustainable network operations. This high degree of customizability empowers developers with greater autonomy while maintaining compatibility with Ethereum's security guarantees and liquidity ecosystem, fostering seamless integration with broader Web3 innovations.

2.5 Interoperability and Cross-Chain Connectivity

Onyx's Layer 3 architecture is designed to facilitate seamless interoperability between multiple blockchain networks, enabling efficient cross-chain communication and asset transfers. Unlike siloed blockchain ecosystems that struggle with fragmented liquidity and isolated smart contract execution, Onyx acts as a bridge between Layer 1 and Layer 2 networks, ensuring that decentralized applications (DApps) can function across different protocols with minimal friction. By integrating with Ethereum, Arbitrum, and Base, Onyx establishes a highly connected infrastructure where assets, data, and transactions can flow freely between networks, unlocking new opportunities for decentralized finance (DeFi), gaming, and enterprise blockchain solutions.

One of the key advantages of Onyx's approach to interoperability is its ability to harmonize cross-chain interactions without introducing excessive trust assumptions. Through advanced rollup-based validation and secure messaging protocols, Onyx enables smart contracts to interact across different networks while maintaining cryptographic integrity and security guarantees. This ensures that developers can deploy multi-chain applications that leverage liquidity pools, governance models, and computing resources from diverse ecosystems, all while preserving the decentralized principles of blockchain technology. The seamless transfer of assets between Layer 1 and Layer 2

solutions also mitigates the liquidity fragmentation that plagues many blockchain networks, promoting a more efficient and scalable DeFi environment.

Beyond facilitating cross-chain interactions, Onyx fosters a developer-friendly ecosystem by providing standardized APIs, cross-chain communication tools, and modular frameworks that simplify integration with existing blockchain infrastructures. Developers building on Onyx can take advantage of Ethereum's deep liquidity, Arbitrum's scalability, and Base's economic security, ensuring that their applications can interact seamlessly with the broader Web3 landscape. By enabling a unified and frictionless blockchain experience, Onyx empowers projects to scale beyond the limitations of individual networks, fostering a future where blockchain interoperability is no longer a challenge but a fundamental feature of decentralized innovation.

2.6 Economic and Governance Advantages

Onyx's economic model is anchored by the XCN token, which functions as the native gas token, ensuring a seamless and efficient transaction mechanism across the network. By utilizing XCN, Onyx aligns incentives among users, developers, and validators, fostering an economically sustainable environment that supports long-term growth and adoption. Unlike traditional Layer 1 or Layer 2 networks that rely on costly and unpredictable fee structures, Onyx leverages its Layer 3 architecture to maintain low and predictable transaction costs, making it more accessible for large-scale decentralized applications (DApps) and institutional use cases. Additionally, staking mechanisms and validator incentives within the network further enhance economic stability, as participants are encouraged to act in the best interest of the protocol while securing the ecosystem.

Beyond its economic efficiencies, Onyx is built on a decentralized governance framework facilitated by the Onyx DAO, allowing the community to actively shape the network's evolution. XCN holders have governance rights that enable them to propose and vote on protocol upgrades, fee structures, ecosystem initiatives, and security enhancements, ensuring that Onyx remains adaptable and aligned with its users' needs. This participatory governance model not only strengthens decentralization but also fosters a more resilient and transparent ecosystem, where decision-making is democratized rather than centralized. As a result, Onyx's Layer 3 approach is not just an advancement in blockchain scalability and interoperability but also a blueprint for sustainable, community-driven innovation, empowering developers and users alike to take part in shaping the future of decentralized finance and beyond.

3.Architecture

3.1 Overview of Onyx Architecture

Onyx functions as a Layer 3 (L3) blockchain, structured on top of a Layer 2 (L2) network, which ultimately settles on Ethereum's Layer 1 (L1). This hierarchical structure allows Onyx to inherit Ethereum's security guarantees while significantly improving scalability, transaction efficiency, and cost reduction. The design of Onyx integrates key components that optimize transaction execution, ensure data availability, and enhance economic security through a sustainable fee model.

Core Components of Onyx's Architecture:

3.1.1 Execution Environment.

- Onyx leverages the Arbitrum Nitro stack to process transactions and execute smart contracts with full Ethereum Virtual Machine (EVM) compatibility.
- The execution environment operates under an optimistic rollup model, bundling multiple transactions and settling them efficiently to reduce computational burden and gas costs.
- Advanced fraud-proof mechanisms ensure the correctness of state transitions while maintaining a high-performance execution layer.

Example:

```
contract RollupCore {
    mapping(uint256 => bytes32) public stateRoots;
    event RollupBatchSubmitted(uint256 indexed batchNumber, bytes32 stateRoot);
    function submitBatch(uint256 batchNumber, bytes32 stateRoot) external {
        stateRoots[batchNumber] = stateRoot;
        emit RollupBatchSubmitted(batchNumber, stateRoot);
    }
}
```

3.1.2 Data Availability Layer.

- Onyx integrates AnyTrust, an optimized data availability solution, reducing the need for on-chain data storage while ensuring trust-minimized verification.
- Data Availability Committee (DAC) nodes guarantee that transaction data remains retrievable and verifiable without overburdening Ethereum L1.

Example:

```
contract AnyTrustDAC {
    mapping(uint256 => bool) public approvedBatches;
    function approveBatch(uint256 batchId) external {
        require(msg.sender == authorizedCommitteeMember, "Not authorized");
        approvedBatches[batchId] = true;
    }
}
```

3.1.3 Settlement Layer.

- Onyx transactions are finalized on Coinbase's Base L2, leveraging Base's economic security model and low-cost settlement layer.
- Once transactions are confirmed in Onyx's execution environment, they are settled on Base L2 before finality on Ethereum L1, optimizing efficiency.

Example:

```
contract BaseSettlement {
    event TransactionFinalized(uint256 indexed batchId, address indexed sender);

    function finalizeTransaction(uint256 batchId, address sender) external {
        require(batchId > 0, "Invalid batch ID");
        emit TransactionFinalized(batchId, sender);
    }
}
```

3.1.4 Gas Token: XCN and EIP-1559 Integration.

- Onyx employs XCN as its native gas token, enabling efficient transaction processing and smart contract execution.
- The network has integrated EIP-1559, introducing a base fee mechanism where a portion of each transaction fee is burned, reducing the overall supply of XCN over time.
- EIP-1559 ensures predictable gas fees while aligning incentives for validators and token holders by creating a deflationary effect on XCN.

Example:

```
contract OnyxGasManager {
    address public xcnToken;
    uint256 public baseFee;

    constructor(address _xcnToken) {
        xcnToken = _xcnToken;
        baseFee = 1000000000; // Example base fee in wei
    }

    function payGasFees(address user, uint256 amount) external {
        uint256 burnAmount = amount / 10; // Burn 10% of transaction fees
        IERC20(xcnToken).transferFrom(user, address(this), amount - burnAmount);
        IERC20(xcnToken).burn(burnAmount);
    }
}
```

3.2 Execution Environment.

The execution environment is the computational backbone of Onyx, responsible for processing transactions, executing smart contracts, and ensuring network efficiency. At its core, Onyx leverages the Arbitrum Nitro stack, an advanced Layer 3 scaling technology that maintains full Ethereum Virtual Machine (EVM) compatibility, allowing developers to deploy and execute smart contracts without requiring modifications.

Core Features of Onyx's Execution Environment:

3.2.1 Optimized Transaction Processing.

- Onyx employs optimistic rollup technology, which batches multiple transactions before finalizing them on Layer 2 and Layer 1, significantly reducing network congestion and improving scalability.
- Transactions are processed in a high-performance Sequencer before being posted to the rollup contract, ensuring rapid execution while maintaining deterministic ordering.

Example:

```
contract OnyxSequencer {
    mapping(uint256 => bytes32) public transactionBatches;
    event BatchProcessed(uint256 indexed batchNumber, bytes32 batchHash);

    function processBatch(uint256 batchNumber, bytes32 batchHash) external {
        transactionBatches[batchNumber] = batchHash;
        emit BatchProcessed(batchNumber, batchHash);
    }
}
```

3.2.2 Advanced Compression Algorithms.

- Onyx leverages statistical encoding and delta compression techniques to minimize the size of transaction data before submission.

- This approach reduces the cost per transaction and ensures efficient bandwidth utilization across the rollup network.

3.2.3 Fraud Proofs and Security.

- The execution environment supports efficient fraud proofs, allowing participants to challenge invalid transactions by submitting proofs of incorrect state transitions.
- Fraud-proof mechanisms utilize a delayed execution window, giving validators time to dispute fraudulent activity before finalization.

Example:

```
contract OnyxFraudProof {
    mapping(uint256 => bytes32) public challengedTransactions;
    event FraudReported(uint256 indexed txId, bytes32 fraudProof);

    function reportFraud(uint256 txId, bytes32 fraudProof) external {
        challengedTransactions[txId] = fraudProof;
        emit FraudReported(txId, fraudProof);
    }
}
```

3.2.4 Optimized Rollup Mechanics.

- Onyx employs multi-round interactive dispute resolution, ensuring that invalid state transitions can be efficiently challenged and corrected.
- The rollup contract integrates an aggregated proof mechanism, bundling multiple proofs together to optimize network overhead.

Example:

```
contract OnyxRollup {
    mapping(uint256 => bytes32) public rollupState;
    event StateUpdated(uint256 indexed batchId, bytes32 newStateRoot);

    function updateState(uint256 batchId, bytes32 newStateRoot) external {
        rollupState[batchId] = newStateRoot;
        emit StateUpdated(batchId, newStateRoot);
    }
}
```

3.3 Execution Efficiency.

The execution efficiency of Onyx is designed to maximize transaction throughput, reduce computational bottlenecks, and optimize gas costs for developers and users. Leveraging Arbitrum

Nitro's advanced rollup technology, Onyx ensures that smart contract execution and transaction finality occur in a predictable, scalable, and cost-effective manner.

3.3.1 Deterministic Finality.

Onyx ensures deterministic finality, meaning that state transitions are finalized in a well-defined, predictable manner. Unlike traditional blockchain networks where transaction confirmation times can fluctuate, Onyx leverages a Sequencer that processes transactions in a first-in, first-out (FIFO) order and submits them to the rollup contract. The execution engine guarantees that once a transaction is processed within a batch, it is committed and cannot be reordered.

Example:

```
contract OnyxFinality {
    mapping(uint256 => bytes32) public finalizedBatches;
    event BatchFinalized(uint256 indexed batchId, bytes32 stateRoot);

    function finalizeBatch(uint256 batchId, bytes32 stateRoot) external {
        require(finalizedBatches[batchId] == bytes32(0), "Batch already finalized");
        finalizedBatches[batchId] = stateRoot;
        emit BatchFinalized(batchId, stateRoot);
    }
}
```

This ensures that developers can rely on consistent execution order and predictable transaction finality, reducing the risk of unexpected delays or reorgs.

3.3.2 Parallelized Execution.

To improve transaction throughput, Onyx supports parallel execution, allowing multiple transactions to be processed simultaneously without conflicting state dependencies. The execution engine is designed to batch transactions that do not share state dependencies into separate processing threads, reducing bottlenecks and increasing overall network efficiency.

Parallel execution enables compute-heavy decentralized applications (DApps), such as on-chain machine learning models or large-scale DeFi aggregators, to operate at optimal speeds without being constrained by sequential processing.

Example:

```
contract OnyxParallelExecution {
    struct ExecutionTask {
        uint256 taskId;
        bytes32 executionState;
    }

    mapping(uint256 => ExecutionTask) public executionQueue;
    event TaskProcessed(uint256 indexed taskId, bytes32 executionState);

    function processTask(uint256 taskId, bytes32 executionState) external {
        executionQueue[taskId] = ExecutionTask(taskId, executionState);
        emit TaskProcessed(taskId, executionState);
    }
}
```

By distributing execution loads across multiple parallel task handlers, Onyx significantly enhances the scalability and responsiveness of smart contract operations.

3.3.4 Gas Fee Reduction with Dynamic Metering.

Gas costs are a critical concern for developers and users interacting with Layer 3 applications. Onyx implements dynamic gas metering, which adjusts gas costs based on network congestion and computational load, ensuring a cost-efficient environment even during high traffic periods.

- Optimized gas refunds for efficient contract execution
- Adaptive pricing model based on on-chain congestion levels
- Batch transaction fee amortization for reduced individual transaction costs

Example:

```
contract OnyxGasMetering {
    uint256 public baseGasFee;
    event GasFeeUpdated(uint256 newBaseFee);

    function adjustGasFee(uint256 newBaseFee) external {
        baseGasFee = newBaseFee;
        emit GasFeeUpdated(newBaseFee);
    }
}
```

By dynamically adjusting fees in real-time, Onyx prevents gas price spikes from negatively impacting network usability, allowing developers to maintain stable and predictable deployment costs.

The integration of deterministic finality, parallelized execution, and gas fee optimizations ensures that Onyx remains a scalable, cost-effective, and high-performance execution environment for the next generation of decentralized applications.

3.4 Data Availability with AnyTrust Protocol.

Data availability is a fundamental component of blockchain scalability and security, ensuring that all transaction data remains accessible, verifiable, and resistant to manipulation. Onyx integrates AnyTrust, an advanced data availability protocol that enhances storage efficiency while preserving trust-minimized security. By shifting the burden of full on-chain storage to a more optimized off-chain model, AnyTrust enables faster transaction finality, lower operational costs, and improved blockchain performance.

Core Components of AnyTrust in Onyx

3.4.1 Data Availability Committee (DAC).

- AnyTrust operates with a Data Availability Committee (DAC), a permissioned set of nodes responsible for collectively ensuring that transaction data remains available and retrievable.
- The DAC consists of trusted validators and network participants, who sign commitments attesting to data availability before transactions are finalized.
- Only a subset of committee members must be honest to guarantee that data remains accessible, making the system resilient to failures or malicious activity.

Example:

```
contract OnyxDAC {
    mapping(uint256 => bool) public verifiedBatches;
    event BatchVerified(uint256 indexed batchId);

    function verifyBatch(uint256 batchId) external {
        require(msg.sender == authorizedCommitteeMember, "Unauthorized access");
        verifiedBatches[batchId] = true;
        emit BatchVerified(batchId);
    }
}
```

3.4.2 Off-Chain Storage Mechanisms.

- Onyx reduces mainnet storage burdens by storing bulk transaction data off-chain while maintaining cryptographic proofs on-chain.
- The execution environment submits commitments of transaction data to the rollup smart contract, ensuring that only essential verification data is retained on-chain.
- The use of Merkle trees and hash commitments allows for efficient verification, without requiring full transaction storage on Ethereum.

Example:

```
contract OnyxMerkleStorage {
    mapping(uint256 => bytes32) public merkleRoots;
    event MerkleRootStored(uint256 indexed batchId, bytes32 root);

    function storeMerkleRoot(uint256 batchId, bytes32 root) external {
        merkleRoots[batchId] = root;
        emit MerkleRootStored(batchId, root);
    }
}
```

3.4.3 Fallback to Ethereum for Data Recovery.

- In the event of a DAC failure or a data withholding attack, Onyx implements a trustless fallback mechanism that allows users to recover transaction data from Ethereum.
- The system stores critical transaction proofs on Ethereum Layer 1, ensuring that rollup integrity is never compromised, even if off-chain storage becomes unavailable.
- A smart contract verifier enables users to submit transaction proofs for reconstruction.

Example:

```
contract OnyxFallbackRecovery {
    mapping(bytes32 => bool) public validatedProofs;
    event ProofRecovered(bytes32 indexed proofHash);

    function recoverProof(bytes32 proofHash) external {
        require(!validatedProofs[proofHash], "Proof already submitted");
        validatedProofs[proofHash] = true;
        emit ProofRecovered(proofHash);
    }
}
```

3.4.4 Benefits of AnyTrust in Onyx.

- Optimized Gas Costs: Reduces the expense of storing transaction data on Ethereum by shifting storage to a dedicated committee.
- Enhanced Throughput: Enables Onyx to process high volumes of transactions efficiently without network congestion.
- Secure Data Availability: Ensures transaction data remains accessible and verifiable, even in cases of off-chain storage failure.

By leveraging AnyTrust's DAC model, cryptographic data proofs, and Ethereum-based fallback mechanisms, Onyx ensures a highly scalable, trust-minimized, and cost-effective data availability solution for developers building next-generation decentralized applications.

3.5 Settlement on Coinbase's Base Layer 2.

Settlement is a critical component of the Onyx architecture, ensuring economic security, finality, and seamless interaction with the broader Ethereum ecosystem. Onyx utilizes Coinbase's Base Layer 2, an Optimistic Rollup built on the OP Stack, to facilitate fast and cost-effective transaction settlement before finalizing state commitments on Ethereum Layer 1 (L1). This layered approach optimizes throughput, enhances network interoperability, and significantly reduces transaction costs, making Onyx a robust and scalable Layer 3 solution.

3.5.1 Transaction Settlement Mechanism.

Onyx executes transactions within its Layer 3 rollup environment, where batches of transactions are processed and validated before being submitted to Base L2 for settlement. The process follows a structured pipeline:

1. **Transaction Execution in Onyx L3:**
    a. Transactions are processed within Onyx's execution environment, leveraging the Arbitrum Nitro stack.
    b. Validated transactions are collected into rollup batches, reducing on-chain congestion and improving efficiency.
2. **Batch Submission to Base L2:**
    a. The Onyx rollup sequencer periodically submits state updates to Base L2.
    b. A state commitment hash representing the new Onyx chain state is posted to a settlement contract on Base L2.
3. **Finalization on Ethereum L1:**
    a. After a challenge period (inherent to Optimistic Rollups), finalized transaction data is submitted from Base L2 to Ethereum L1.
    b. This ensures economic security and trust minimization, while leveraging Ethereum's robust decentralization.
    Example:

```
contract OnyxSettlementL2 {
    address public baseL2Contract;
    mapping(uint256 => bytes32) public batchStateRoots;
    event BatchSettled(uint256 indexed batchId, bytes32 stateRoot);

    constructor(address _baseL2Contract) {
        baseL2Contract = _baseL2Contract;
    }

    function settleBatch(uint256 batchId, bytes32 stateRoot) external {
        require(msg.sender == baseL2Contract, "Unauthorized sender");
        batchStateRoots[batchId] = stateRoot;
        emit BatchSettled(batchId, stateRoot);
    }
}
```

3.5.2 Economic Security and Optimistic Rollup Finality.

Base L2 operates as an Optimistic Rollup, meaning transactions are considered valid by default but can be challenged within a predefined dispute window. This model significantly reduces settlement costs while preserving security through fraud proofs. The economic security model of Onyx settlement on Base L2 includes:

- **Fraud Proof Mechanism**: Validators can challenge suspicious transactions, preventing invalid state updates.
- **Time-Delayed Finality**: Transactions are posted optimistically but require a dispute period before being committed to Ethereum L1.
- **Base L2 Validation Rules**: Onyx's state commitments are verified by Base's settlement smart contracts, ensuring integrity.

Example:

```
contract OnyxFraudProof {
    mapping(uint256 => bool) public challengedBatches;
    event FraudChallenge(uint256 indexed batchId, address challenger);

    function challengeBatch(uint256 batchId) external {
        require(!challengedBatches[batchId], "Batch already challenged");
        challengedBatches[batchId] = true;
        emit FraudChallenge(batchId, msg.sender);
    }
}
```

3.5.3 Interoperability with Ethereum and Other Layer 2 Networks.

By settling on Base L2, Onyx applications inherit Ethereum's deep liquidity and security model while maintaining efficient cross-chain communication. The settlement layer facilitates seamless asset bridging, allowing developers to interact with Ethereum, other Layer 2 solutions, and external blockchain ecosystems.

- **Atomic Cross-Layer Transactions**: Onyx transactions can trigger operations on both Base L2 and Ethereum L1 in a single execution flow.
- **Bridge Contracts for L2-L3 Communication**: A custom bridge implementation facilitates smooth data and asset transfers between Onyx L3 and Base L2.
- **Shared Security Model**: By leveraging Ethereum's finality guarantees, Onyx ensures a tamper-proof settlement process.

Example:

```
contract OnyxBridge {
    address public baseL2Bridge;
    event AssetTransferred(address indexed user, uint256 amount, uint256 destinationLayer);

    function transferToL2(uint256 amount) external {
        emit AssetTransferred(msg.sender, amount, 2); // Base L2
    }
}
```

3.5.4 Optimized Fee Structures.

One of the major advantages of settling on Base L2 is the substantial reduction in gas fees compared to directly transacting on Ethereum L1. Onyx benefits from:

- **Batch Compression**: Onyx transactions are aggregated into rollup batches, reducing the data footprint per transaction.
- **Optimistic Execution Model**: Fees are minimized by assuming transaction validity unless challenged.
- **Lower Cost Per Settlement**: Instead of every transaction incurring L1 gas fees, Onyx batches multiple transactions, amortizing costs across users.

Example:

```
contract OnyxFeeManager {
    uint256 public baseFee;
    event FeeUpdated(uint256 newBaseFee);

    function adjustBaseFee(uint256 newFee) external {
        baseFee = newFee;
        emit FeeUpdated(newFee);
    }
}
```

3.6 Custom Gas Token: XCN.

Onyx employs XCN as its native gas token, providing a cost-effective and scalable fee mechanism tailored to the needs of Layer 3 applications. Unlike Ethereum's traditional gas model, which relies on ETH for transaction processing, Onyx introduces a customized fee structure that ensures predictable costs, enhanced economic flexibility, and application-specific gas optimizations. By leveraging XCN, Onyx achieves a more efficient and developer-friendly approach to transaction execution and network participation.

3.6.1 Advantages of Using XCN as the Gas Token.

A) Reduced Transaction Fees

- XCN allows significantly lower gas fees compared to Ethereum's native gas model by utilizing Layer 3 batching and compression techniques.
- The Onyx execution environment applies dynamic gas optimization, reducing gas overhead per transaction while maintaining execution integrity.
- Batch processing minimizes the number of individual transactions posted to the Layer 2 settlement layer, further lowering fees for users.

B) Fee Stability and Predictability

- Unlike ETH gas fees, which fluctuate based on Ethereum network congestion, Onyx's XCN-based model ensures stable and predictable transaction costs.
- Dynamic fee adjustments within the Onyx network allow for adaptive gas pricing, optimizing cost-efficiency for different types of transactions.

C) Application-Specific Fee Customization

- Developers building on Onyx can implement custom gas policies, enabling DApps to subsidize fees, set tiered fee structures, or integrate incentive-based fee reductions.
- Smart contracts within Onyx can define custom gas token policies, allowing developers to create fee delegation mechanisms where users interact with contracts without holding XCN directly.

3.6.2 XCN Gas Fee Mechanism.

Onyx implements EIP-1559[3] for gas pricing and token burns, ensuring a sustainable economic model while preventing unnecessary inflation of the XCN supply. The EIP-1559 mechanism introduces:

- **Base Fee**: A network-determined minimum fee that adjusts dynamically based on demand.
- **Priority Fee**: An optional tip that users can include to prioritize transaction execution.
- **Burn Mechanism**: A portion of the Base Fee is permanently burned, reducing the circulating supply of XCN over time.

Example:

```
contract OnyxGasManager {
    address public xcnToken;
    uint256 public baseFee;
    event GasFeePaid(address indexed user, uint256 amount, uint256 burned);

    constructor(address _xcnToken) {
        xcnToken = _xcnToken;
        baseFee = 1000000000; // Example base fee in wei
    }

    function payGasFees(address user, uint256 amount) external {
        uint256 burnAmount = amount / 10; // Burn 10% of transaction fees
        IERC20(xcnToken).transferFrom(user, address(this), amount - burnAmount);
        IERC20(xcnToken).burn(burnAmount);
        emit GasFeePaid(user, amount, burnAmount);
    }
}
```

3.6.3 Gas Abstraction and Fee Delegation.

Onyx enables gas abstraction mechanisms, allowing users to interact with smart contracts without directly holding XCN. This is made possible through meta-transactions, where a third party can cover gas fees on behalf of the user.

- **Sponsored Transactions**: Applications can subsidize gas costs for users, improving accessibility.
- **Multi-Token Fee Support**: Future implementations may allow gas fees to be paid using supported ERC-20 tokens, with real-time conversion to XCN.

Example:

```
contract OnyxMetaTransaction {
    address public relayer;
    mapping(address => bool) public authorizedRelayers;
    event MetaTransactionExecuted(address indexed user, bytes transactionData);

    function executeMetaTransaction(address user, bytes calldata transactionData) external {
        require(authorizedRelayers[msg.sender], "Unauthorized relayer");
        (bool success, ) = address(this).call(transactionData);
        require(success, "Transaction failed");
        emit MetaTransactionExecuted(user, transactionData);
    }
}
```

By integrating custom gas policies, EIP-1559-based burns, and meta-transaction capabilities, Onyx ensures a scalable, predictable, and developer-friendly gas system that enhances the usability and economic sustainability of the network.

3.7 Core Smart Contracts.

In the Onyx Layer 3 blockchain architecture, a suite of core smart contracts ensures seamless transaction processing, state management, and interoperability with Ethereum and Base Layer 2. These contracts facilitate rollup execution, data availability, governance, and cross-layer communication. Below is a breakdown of **12** essential smart contracts in Onyx, including their key responsibilities.

3.7.1 Rollup Smart Contract.

The `Rollup` Smart Contract is responsible for managing Onyx's state transitions. It sequences and validates rollup batches, ensuring data consistency across the network.

Key Responsibilities:
- State Root Management: Tracks batch numbers and their associated state roots.
- Batch Submission: Enables validators to submit new rollup batches and update state roots.

3.7.2 Inbox Smart Contract.

The `Inbox` Smart Contract handles incoming messages and transaction batching, ensuring that Layer 3 transactions are correctly enqueued before execution.

Key Responsibilities:
- Message Queuing: Stores and organizes messages before processing.
- Batch Processing: Groups multiple messages into batches for efficiency.

3.7.3 Outbox Smart Contract.

The `Outbox` Smart Contract ensures that transactions enqueued in the Inbox are executed and finalized on the Layer 1 or Layer 2 settlement layer.

Key Responsibilities:
- Execution Finalization: Processes messages sent from the rollup layer.
- Cross-Layer Communication: Ensures seamless interaction between Onyx L3 and its settlement layer.

3.7.4 AdminProxy Smart Contract.

The `AdminProxy` Smart Contract manages administrative permissions and upgradeability within the Onyx protocol.

Key Responsibilities:
- Permissioned Access: Restricts administrative functions to authorized accounts.
- Protocol Upgrades: Enables controlled modifications to core smart contracts.

3.7.5 Utilities Smart Contract.

The `Utilities` Smart Contract provides essential helper functions that optimize interactions with Onyx's core contracts. It enhances network efficiency by implementing reusable logic for data hashing, gas metering, and batch processing.

Key Responsibilities:
- Gas Optimization: Reduces gas costs for transactions by implementing efficient encoding and execution strategies.
- Transaction Hashing: Provides cryptographic hash functions to validate transactions across smart contracts.
- Batch Execution Support: Implements helper functions to facilitate multi-call transactions.

3.7.6 ValidatorWalletCreator Smart Contract.

The `ValidatorWalletCreator` Smart Contract is responsible for managing validator wallets in the Onyx ecosystem. Validators play a crucial role in processing rollup transactions and securing the network.

Key Responsibilities:
- Validator Wallet Creation: Generates and initializes wallets for new validators.
- Stake Management: Handles validator staking, allowing for deposit and withdrawal of staking amounts.
- Security Enforcement: Ensures only authorized validators can manage wallet functions.

3.7.7 L3UpgradeExecutor Smart Contract.

The `L3UpgradeExecutor` Smart Contract is responsible for executing protocol upgrades within Onyx Layer 3. It ensures seamless and secure updates to smart contracts, preventing unauthorized modifications.

Key Responsibilities:
- Upgrade Execution: Enables the deployment of authorized upgrades to Onyx's core contracts.
- Security Governance: Implements access control mechanisms to prevent unauthorized updates.
- Version Management: Tracks contract upgrades and maintains a history of changes.

3.7.8 CustomGateway Smart Contract.

The `CustomGateway` Smart Contract manages token transfers between Layer 3 and Layer 2.

Key Responsibilities:
- Token Deposits and Withdrawals: Tracks token balances for cross-layer movement.
- Security Enforcement: Prevents unauthorized transfers.

3.7.9 Multicall Smart Contract.

The `Multicall` Smart Contract allows multiple function calls within a single transaction, reducing execution overhead.

Key Responsibilities:

- Batch Execution: Groups function calls to minimize gas costs.
- Atomic Operations: Ensures all calls execute successfully, or none execute at all.

3.7.10 ProxyAdmin Smart Contract.
The `ProxyAdmin` Smart Contract handles administrative functions related to contract proxies.

Key Responsibilities:
- Proxy Management: Allows modifications to proxy implementations.
- Access Control: Ensures only authorized parties can change proxies.

3.7.11 Router Smart Contract.
The `Router` Smart Contract manages routing between different smart contracts within the Onyx ecosystem.

Key Responsibilities:
- Smart Contract Routing: Directs function calls between key system components.
- Upgradeability Support: Allows modular contract updates.

3.7.12 StandardGateway Smart Contract.
The `StandardGateway` Smart Contract facilitates standard token bridging between Onyx and external layers.

Key Responsibilities:
- Standardized Token Transfers: Enables seamless token movement between layers.
- Interoperability: Supports ERC-20 token bridging for external integrations.

4. Onyxcoin (XCN).

Onyxcoin (XCN) serves as the native token within the Onyx ecosystem, designed to function as the primary gas token facilitating transaction fees, smart contract execution, and various on-chain operations such as staking and governance. As an ERC-20 token deployed on the Ethereum blockchain, XCN ensures seamless compatibility with Ethereum's established infrastructure and tooling, providing a reliable foundation for decentralized applications (DApps) and services within the Onyx network.

The ERC-20 standard, widely recognized for its interoperability and security, allows XCN to integrate effortlessly with a multitude of Ethereum-based platforms, wallets, and decentralized finance (DeFi) applications. This ensures that users can securely store, transfer, and utilize XCN within the Ethereum ecosystem without additional modifications or proprietary integrations.

Despite being an Ethereum-native asset, Onyx has implemented mechanisms to extend the utility of XCN beyond Ethereum, enabling cross-chain functionality through bridging technologies. These bridges facilitate seamless token transfers to multiple blockchain networks, ensuring broader accessibility and usability.

XCN also plays a crucial role in network security by being used in staking mechanisms, where participants commit tokens to ensure integrity and overall protocol stability. Through these mechanisms, XCN not only fuels the Onyx blockchain's operations but also reinforces economic security and decentralization within the network through its governance and staking mechanisms.

4.1 XCN as the Gas Token of Onyx.

Onyxcoin (XCN) functions as the primary gas token within the Onyx Layer 3 blockchain, facilitating network fees, transaction execution, and smart contract operations. Its implementation within a Layer 3 environment ensures efficient fee structures, cost minimization, and enhanced scalability compared to traditional Layer 1 execution.

XCN is used to pay gas fees for all transactions on the Onyx network. This includes:

- Token transfers between addresses within the Onyx ecosystem.
- Executing smart contracts for decentralized applications (DApps).
- State updates and interactions with the Onyx rollup infrastructure.

The use of XCN for transaction fees ensures a low-cost, scalable alternative to Ethereum Layer 1 gas fees, making Onyx an attractive platform for high-frequency transactions and complex decentralized applications.

XCN powers smart contract execution, providing an efficient computation model that ensures predictable gas costs. Developers deploying and interacting with contracts on Onyx benefit from:

- Reduced gas overhead, leveraging Onyx's rollup architecture to process transactions in batches.
- High-performance execution, allowing seamless integration of smart contracts without excessive transaction costs.
- Optimized developer experience, where contract execution costs remain more stable than on Ethereum Layer 1.

Onyx's Layer 3 architecture significantly optimizes gas pricing by implementing rollup batching and transaction aggregation techniques. XCN enables:

- Lower transaction fees compared to Ethereum Layer 1, ensuring a cost-efficient environment for users and developers.
- Predictable and stable gas pricing, reducing reliance on fluctuating Ethereum network conditions.
- Enhanced scalability, supporting a high volume of transactions without network congestion.

By leveraging XCN as the dedicated gas token, Onyx creates a cost-effective, developer-friendly, and highly scalable transaction processing environment, unlocking new possibilities for decentralized applications and blockchain-based financial ecosystems.

4.2 XCN Staking.

XCN staking is a fundamental feature of the Onyx ecosystem, allowing token holders to lock their assets within the Onyx staking contract to participate in governance and earn staking rewards. Unlike traditional staking models, XCN staking does not impose a mandatory lock-up period, enabling participants to unstake at any time according to the contract's withdrawal mechanisms. Staking plays a crucial role in decentralized governance, reinforcing long-term engagement and aligning the interests of stakeholders with the Onyx protocol's ongoing development. XCN staking is exclusively available on the Ethereum blockchain.

The XCN staking mechanism is structured to achieve multiple objectives, including:

- **Governance Participation**: Stakers gain voting rights in the Onyx DAO, allowing them to propose and vote on protocol upgrades, fee structures, and treasury allocations.
- **Earning Staking Rewards**: Participants receive staking incentives from the Onyx Distribution smart contract, ensuring continued engagement and economic alignment with the network.
- **Economic Stability**: Staking reduces circulating supply, contributing to network stability by encouraging long-term holding.

The staking process in Onyx follows a structured model governed by smart contracts deployed on Ethereum. The staking mechanism includes:

1. **Token Locking**: Users deposit XCN into the staking contract, where it is counted toward their governance voting power.
2. Governance Weight **Calculation: The amount of XCN staked determines the participant's** voting power in the Onyx DAO, ensuring proportional influence based on commitment.
3. **Rewards Distribution**: A fixed monthly allocation is available for staking participants while the reward program is in effect. These parameters can be updated via on-chain governance.
4. **Unstaking Process**: Users may unstake their XCN at any time without penalty, subject to the protocol's withdrawal rules.

Staking XCN provides governance rights, enabling participants to propose and vote on Onyx protocol decisions which is detailed in the next section. Staking rewards are determined by an individual's relative stake within the total staking pool. The formula for calculating staking rewards is:

```
Monthly Reward Pool * (Your XCN Staked / Total XCN Staked) = Your Monthly Reward
```

This ensures that rewards are proportionally distributed based on participation.

4.3 XCN Governance.

XCN serves as the governance token of the Onyx DAO, enabling decentralized, on-chain governance where token holders can propose, vote on, and execute protocol changes. The governance framework is implemented via smart contracts, ensuring a secure, transparent, and permissionless decision-making process. All governance operations, including proposal creation, voting, and execution, are automated and enforced by the governance contract deployed on Ethereum.

The Onyx DAO utilizes a structured on-chain governance mechanism, where governance weight is determined by the amount of XCN staked. The governance contract enforces the following workflow:

1. **Proposal Creation**
    - Any address holding at least 100,000,000 XCN in governance weight can submit proposals.
    - Proposals can include protocol upgrades, economic parameter adjustments, treasury allocations, and smart contract modifications.
    - The proposal payload must define the target contract address, function calls, execution parameters, and rationale.
    - Proposals are initiated using the `propose()` function in the governance contract.

2. **Voting Process**
    - Once submitted, proposals enter a 3-day voting period.
    - Staked XCN determines voting power, meaning votes are weighted based on the amount of XCN committed to the governance contract.
    - Participants cast votes using the `castVote()` function, which records votes on-chain and tallies results in real time.
    - The voting options are For, Against, or Abstain.

3. **Quorum and Approval**
    - A proposal is considered successful if it meets the approval threshold of at least 200,000,000 XCN votes in favor.
    - If the quorum is met and a majority vote is achieved, the proposal moves to the execution phase.

4. **Timelock Execution**
    - Approved proposals enter a 2-day timelock, enforced by the governance contract to allow for final review.
    - After the timelock expires, the `execute()` function is called, finalizing the proposal and enacting changes to the protocol.
    - The timelock contract prevents immediate governance takeovers, ensuring a secure and deliberate execution process.

The Onyx DAO governance logic is fully on-chain, defined by the governance smart contract deployed on Ethereum. Key contract functions include:

```
// Function to create a new proposal
targets, values, signatures, calldatas, description
function propose(
    address[] memory targets,
    uint256[] memory values,
    string[] memory signatures,
    bytes[] memory calldatas,
    string memory description
) external returns (uint256);

// Function to cast a vote
function castVote(uint256 proposalId, uint8 support) external;

// Function to queue an approved proposal
function queue(uint256 proposalId) external;

// Function to execute a proposal after timelock
function execute(uint256 proposalId) external;
```

These functions collectively enable decentralized governance, ensuring that proposals follow a structured workflow from initiation to execution. The Onyx DAO is responsible for making critical protocol decisions, including but not limited to:

- **Protocol Upgrades**: Implementing improvements to the Layer 3 infrastructure, optimizing performance, and enhancing security throughout the ecosystem.
- **Economic Policies**: Adjusting staking parameters, transaction fees, and validator incentives.
- **Security Enhancements**: Modifying validator rules, consensus policies, and rollup configurations.

By participating in on-chain voting, staking XCN for governance weight, and submitting proposals, token holders actively contribute to the evolution and security of the Onyx ecosystem.

4.4 XCN Tokenomics and Distribution.

The XCN tokenomics model is designed to provide long-term economic sustainability, balancing supply, utility, and incentives within the Onyx ecosystem. The distribution and allocation of XCN ensure a structured approach to network growth, governance participation, and staking rewards.

XCN was issued with a fixed total supply at genesis, ensuring a predictable economic model without the risk of unexpected inflation. The supply is carefully managed through governance decisions, staking incentives, and controlled emissions. The total supply is structured to support network incentives while maintaining scarcity over time. The current structure of XCN token is itemized below:

- **Max Supply**: Predefined at initial deployment to ensure the amount does not exceed 68,892,071,757 units based on the prior conversions.
- **Total Supply**: The current total supply of XCN stands at 48,402,437,326 which has been reduced from the initial max supply.
- **Circulating Supply**: The amount of XCN in units currently in the market which is 32,543,299,886. This number dynamically adjusts based on staking participation, token burns, and emissions.
- **Burn Mechanism**: Implemented through transaction fees and governance-approved mechanisms to maintain a total supply deflationary model.
- **Emission Control**: Governance-driven mechanisms regulate token distribution to staking participants and ecosystem contributors. The emission of XCN is regulated by on-chain and off-chain mechanics to ensure a predictable distribution rate until total supply is reached.
- **Bridged Supply Management**: XCN exists natively on Ethereum but can be bridged to Onyx and Base via Superbridge and BSC via Wormhole. These bridged XCN tokens require onchain validation of the equivalent issued amount to be locked to maintain transparency and to ensure conformance to the total supply of XCN.

A portion of XCN total supply is allocated to the Onyx Treasury, managed by the Onyx DAO. These funds are used to support protocol development, grants, liquidity incentives, and strategic partnerships. The Treasury's allocation is governed by on-chain voting, ensuring decentralized oversight of fund utilization. Treasury-controlled funds may be deployed in:

- **Ecosystem Grants**: Supporting developers, research initiatives, and infrastructure improvements.

- **Liquidity Incentives**: Providing rewards to liquidity providers across DeFi protocols integrated with Onyx.
- **Protocol Upgrades**: Funding technical improvements and security audits.
- **Strategic Partnerships**: Engaging with institutional and DeFi partners to drive adoption.

Tokenomics parameters, including staking rewards, treasury allocations, and token burns, are fully controlled by the Onyx DAO. The governance model ensures that token supply mechanics evolve based on the needs of the network and economic conditions, balancing incentive distribution with long-term sustainability. By maintaining a structured and governance-driven tokenomics model, XCN ensures a sustainable economic framework for network participants while aligning incentives for validators, stakers, and ecosystem contributors.

4.5 XCN Bridging and Cross-Chain Transfers.

XCN is fundamentally an Ethereum-native ERC-20 token, but its ability to bridge across multiple blockchain networks enhances its liquidity, interoperability, and overall utility. By leveraging trusted cross-chain bridges, XCN seamlessly integrates into various ecosystems, enabling efficient transfers between Ethereum Layer 1, Binance Smart Chain (BSC), Base Layer 2, and Onyx Layer 3. These bridging mechanisms expand the usability of XCN across decentralized finance (DeFi) applications, governance models, and multi-chain smart contract interactions.

To facilitate secure and efficient token movement between different blockchain networks, XCN employs two primary bridging solutions:

1. **Wormhole Bridge**: The Wormhole Bridge[4] enables XCN transfers between Ethereum Mainnet and Binance Smart Chain (BSC), ensuring interoperability between these ecosystems. This bridge operates through a lock-and-mint mechanism:

- **Token Locking on Ethereum**: When a user initiates a bridge transaction, their XCN tokens are locked within a Wormhole smart contract on Ethereum.
- **Wrapped Token Minting on BSC**: An equivalent amount of wrapped XCN (XCN-BSC) is minted on Binance Smart Chain, maintaining a 1:1 pegged value to the original Ethereum-based XCN.
- **Redeeming Back to Ethereum**: When bridging back to Ethereum, the wrapped XCN on BSC is burned, and the locked XCN tokens on Ethereum are released to the user's wallet.

This process ensures value preservation, network security, and cross-chain liquidity availability between Ethereum and BSC.

2. **Superbridge**: The Superbridge[5] enables seamless transfers of XCN to Base Layer 2 and Onyx Layer 3, providing an optimized and cost-effective bridge for users interacting within Ethereum's rollup ecosystem. This bridge is designed to handle scalable, low-fee cross-chain transactions while maintaining full security guarantees.

- **Base Integration**: XCN can be bridged to Base, a Layer 2 solution, benefiting from its low transaction fees, enhanced scalability, and Ethereum compatibility.
- **Onyx Layer 3 Transfers:** The Superbridge extends XCN's availability to Onyx Layer 3, where it is used as the native gas token for smart contract execution and transaction fees.
- **High-Throughput Transactions**: Superbridge is optimized for fast processing, ensuring users experience minimal latency when moving XCN across layers.

By integrating the Superbridge, XCN remains highly flexible, supporting efficient DeFi interactions and DApp deployments on Base and Onyx while reducing reliance on Ethereum's high gas fees.

Bridging mechanisms extend the reach of XCN while preserving its core integrity as an Ethereum-native asset. Key benefits of the bridging infrastructure include:

- **Liquidity Movement**: Enables seamless asset flows across Ethereum, Binance Smart Chain, Base, and Onyx.
- **Multi-Chain DeFi Compatibility**: Supports integrations with liquidity pools, lending protocols, and staking mechanisms across different ecosystems.
- **Security Mechanisms**: Bridges are deployed with smart contract audits, multi-signature governance, and cryptographic verification to ensure safe transfers.

XCN's bridging architecture provides secure, scalable, and efficient cross-chain interoperability, ensuring that users and developers can interact with XCN in multiple ecosystems without compromising security. By integrating with Wormhole and Superbridge, XCN remains a highly adaptable asset capable of supporting a wide range of DeFi applications and smart contract executions across multiple blockchain environments.

5. Onyx Ecosystem.

The Onyx ecosystem is built upon a foundation of scalability, security, and seamless interoperability across multiple blockchain platforms. To streamline the deployment of critical ecosystem integrations, Onyx utilizes Conduit, a Rollup-as-a-Service (RaaS) provider, to automate and optimize the rollup deployment processes. By leveraging Conduit, Onyx has ensured efficient and reliable deployment of key ecosystem integrations, allowing for faster adoption and reduced infrastructure overhead. Through this streamlined process, integrations such as Privy, Bridged

USDC, Superbridge, Tenderly, Thirdweb, and Decent have been seamlessly incorporated into the Onyx network, ensuring a robust and developer-friendly environment.

5.1 Privy: Secure Data Management

Privy[6] is a privacy-focused platform that facilitates secure data storage and management for decentralized applications. Within Onyx, Privy ensures that user data remains encrypted, verifiable, and accessible without compromising privacy.

Key aspects of this integration include:

- Decentralized Authentication: Enables users to log in securely using non-custodial wallets and decentralized identifiers (DIDs), reducing reliance on traditional login credentials.
- Encrypted Storage Solutions: Ensures that sensitive user data, such as transaction histories and smart contract interactions, remains secure and private.
- Zero-Knowledge Proof (ZKP) Capabilities: Supports privacy-preserving computations that allow data verification without revealing underlying sensitive information.

5.2 Bridged USDC: Cross-Chain Stablecoin Liquidity

Bridged USDC refers to USD Coin that has been transferred across blockchain networks via bridging mechanisms, maintaining a 1:1 peg to the original asset. In the Onyx ecosystem, Bridged USDC plays a critical role in decentralized finance (DeFi) applications:

- Liquidity Provisioning: Enables stable trading pairs on Onyx-powered decentralized exchanges (DEXs) and automated market makers (AMMs).
- Collateral for Lending Protocols: Used in decentralized lending markets, allowing users to borrow and lend stable assets without exposure to volatile cryptocurrencies.
- Seamless Cross-Chain Transactions: Facilitates movement of USDC across Ethereum, Base, and Onyx Layer 3, ensuring capital efficiency and frictionless transfers.

5.3 Superbridge: Multi-Chain Asset Transfer

Superbridge is a cross-chain bridging protocol that enables efficient and secure transfers of digital assets between blockchain networks. Within the Onyx ecosystem, Superbridge facilitates seamless token movement to and from Ethereum, Base Layer 2, and Onyx Layer 3.

Technical components of Superbridge include:

- Smart Contract Lock & Mint Mechanism: Locks XCN on Ethereum and mints a corresponding amount of wrapped XCN on Base and Onyx.
- Optimistic Rollup Security Model: Reduces reliance on centralized validators, ensuring trustless and secure transfers.
- Fast Finality Transactions: Optimized transaction processing speeds minimize confirmation times and lower transaction costs.

By integrating Superbridge, Onyx allows XCN and other assets to flow freely across blockchain networks, enabling a scalable and interoperable multi-chain environment.

5.4Tenderly: Smart Contract Monitoring & Debugging

Tenderly[7] is a blockchain development tool that provides real-time monitoring, debugging, and analytics for smart contracts. Onyx developers leverage Tenderly to optimize contract performance, detect anomalies, and troubleshoot issues before deployment.

Key features of Tenderly's integration with Onyx include:

- Automated Smart Contract Monitoring: Tracks contract interactions, providing real-time error detection and execution insights.
- Gas Optimization Analysis: Identifies inefficiencies in smart contract execution, helping developers minimize gas costs.
- State Replay & Debugging Tools: Allows developers to simulate transactions and analyze contract behavior before executing on-chain operations.

This integration significantly enhances developer efficiency, contract reliability, and security within Onyx's smart contract ecosystem.

5.5 Thirdweb: Web3 Developer Toolkit

Thirdweb[8] provides a suite of tools and frameworks that simplify the development, deployment, and management of decentralized applications (DApps). By integrating with Thirdweb, Onyx enables developers to build Web3 applications faster with pre-built infrastructure.

Core benefits include:

- Pre-Configured Smart Contracts: Reduces development time by providing modular, production-ready contract templates.
- NFT & Token Management Tools: Facilitates minting, burning, and transferring assets directly through Thirdweb's APIs.

- Gasless Transactions Support: Allows meta-transactions, enabling users to interact with Onyx DApps without directly paying for gas.

5.6 Decent: Digital Asset Creation & NFT Infrastructure

Decent[9] is an NFT and digital asset platform that enables tokenization of real-world and digital assets. Within Onyx, Decent expands NFT infrastructure and asset tokenization capabilities:

- Multi-Chain NFT Minting: Allows creators to mint NFTs on Ethereum and bridge them to Onyx.
- NFT Marketplace Integration: Supports decentralized trading, fractional ownership, and royalty enforcement.
- Tokenized Real-World Assets (RWAs): Enables the representation of physical assets, intellectual property, and collectibles as blockchain-based tokens.

Decent's integration empowers content creators, artists, and enterprises to launch scalable digital asset solutions within the Onyx network.

5.7 Chain: Enhancing Blockchain-Based Financial Infrastructure

Onyx serves as the underlying Layer 3 blockchain that enhances the performance and scalability of Chain's[10] financial products and services. By leveraging Onyx's high-throughput, low-cost transaction processing, Chain's suite of financial tools can operate more efficiently while maintaining Ethereum-grade security. Onyx provides a robust, scalable infrastructure that enhances Chain's digital asset solutions by enabling faster settlement, improved liquidity management, and seamless smart contract execution.

Chain's financial solutions require a high-performance settlement layer to process transactions securely and efficiently. Onyx, as a Layer 3 rollup built on Arbitrum Orbit and Base Layer 2, significantly reduces transaction costs and confirmation times compared to Layer 1 networks. Chain will be able to deploy sub-chains under the Onyx Layer 3 to create permissioned environments alongside specialized smart contracts directly on the Layer 3 network to meet their product demands. This allows Chain's users to experience:

- Reduced settlement latency, ensuring near-instantaneous finality for financial transactions.
- Lower gas fees, making microtransactions and high-frequency trading more cost-effective.
- Enhanced security, as Onyx inherits Ethereum's security guarantees while optimizing transaction throughput.

Onyx also will provide Chain's asset tokenization platform with a scalable and flexible execution environment. By deploying Chain's tokenization solutions on Onyx's Layer 3 infrastructure, users can mint, manage, and transfer tokenized financial instruments, stablecoins, and real-world assets (RWAs) efficiently. Key benefits include:

- Seamless issuance and transfer of digital assets with low transaction fees.
- Customizable smart contract frameworks for asset management, compliance automation, and programmable financial instruments.
- Cross-chain interoperability, allowing tokenized assets to interact with Ethereum, Base, and other Layer 2 ecosystems.

By utilizing Onyx as its execution layer, Chain's financial platforms can integrate automated market makers (AMMs), decentralized finance (DeFi) protocols, and liquidity pools that benefit from Onyx's scalability. This enables:

- Efficient liquidity provisioning, reducing price slippage and market inefficiencies.
- Cross-chain trading capabilities, leveraging Onyx's interoperability for seamless asset transfers between Layer 1, Layer 2, and Layer 3 networks.
- Institutional-grade DeFi integrations, providing enterprises with access to secure, high-speed decentralized financial infrastructure.

Onyx's Layer 3 architecture ensures that Chain's financial applications maintain enterprise-level security while benefiting from a decentralized execution environment. Onyx enables:

- Smart contract audits and on-chain governance to enhance regulatory compliance.
- Multi-signature authentication and role-based access control for secure asset custody.
- Transaction finality and anti-censorship mechanisms, ensuring transparent and immutable financial records.

By integrating Onyx's scalable Layer 3 blockchain infrastructure, Chain's financial tools benefit from enhanced transaction efficiency, secure asset tokenization, and improved market liquidity. This collaboration enables Chain to deliver high-performance, Ethereum-compatible financial solutions that meet the needs of both institutional and decentralized finance (DeFi) participants. Onyx provides the technical foundation for Chain's onchain based financial applications, reinforcing its position as a leader in blockchain-based financial infrastructure.

6. Roadmap: Advancing Layer 3 Innovation.

Onyx encourages the community of open-source developers and community participants to actively explore advancements to expand its Layer 3 blockchain infrastructure to meet the growing demands of decentralized applications (DApps), finance, and next-generation blockchain use cases. The following roadmap outlines strategic developments in Decentralized Physical Infrastructure Networks (DePINs), Sub-Chains for Permissioned Interoperability, Artificial Intelligence (AI) Integrations, and High-Throughput Processing Enhancements[11]. These potential

advancements are designed to enhance scalability, security, and efficiency, ensuring Onyx remains a leader in the evolving blockchain landscape.

6.1 Decentralized Physical Infrastructure Networks (DePINs)

DePINs present an opportunity for blockchain technology to extend beyond financial transactions and interact directly with physical infrastructure such as energy grids, IoT devices, decentralized wireless networks (DeWi), and supply chain logistics. Onyx aims to position itself as the primary execution and settlement layer for DePIN applications, facilitating seamless interaction between real-world assets and blockchain networks.

Key Developments for DePINs on Onyx:

- **Scalable and Cost-Efficient Data Settlement**: Onyx is expected to provide a low-cost, high-throughput Layer 3 framework capable of handling large-scale off-chain data validation before finalizing transactions on-chain.
- **Tokenized Resource Incentives**: Onyx may implement programmable incentive models that reward real-world infrastructure contributors, such as decentralized energy providers and IoT node operators, through smart contract-driven mechanisms.
- Cross-Chain Oracles and Real-World Data Feeds: Future integrations with oracles and off-chain data providers could allow DePIN projects to seamlessly interact with sensor-based analytics, logistics tracking, and external data sources.
- Enterprise Adoption and Institutional Use Cases: Onyx could facilitate permissioned blockchain solutions that allow enterprises to integrate DePIN models into logistics, infrastructure maintenance, and decentralized energy markets.

6.2 Sub-Chains for Permissioned Interoperability and Enterprise Adoption

Onyx is exploring the development of sub-chains to facilitate seamless interoperability between permissioned enterprise networks and public blockchain infrastructure. These sub-chains would provide enterprises and institutions with a hybrid model combining regulatory compliance with blockchain security.

How Onyx Sub-Chains Will Improve Blockchain Interoperability:

- Dedicated Permissioned Environments: Institutions could deploy custom sub-chains with restricted access control while still interacting with Onyx's Layer 3 infrastructure.
- Cross-Chain Messaging Standards: Onyx is expected to develop secure cross-chain messaging protocols that allow for trustless data and asset transfers between Ethereum, Base, and Onyx sub-chains.

- Customizable Consensus Models: Enterprises may be able to select consensus mechanisms tailored to their industry requirements, optimizing security and efficiency for regulated industries.
- Modular Rollup Deployments: Onyx could offer custom rollup-as-a-service deployments, providing sector-specific blockchain configurations for enterprises, financial institutions, and government entities.

6.3 Artificial Intelligence (AI) on Onyx

Onyx is considering the integration of AI-driven automation and analytics into its Layer 3 stack to enhance smart contract execution, security, and predictive modeling. AI-driven enhancements could redefine how DeFi, digital asset management, and governance structures function on Onyx.

AI-Powered Enhancements on Onyx:

- Onchain AI Models for Smart Contract Optimization: Future AI integrations may introduce adaptive smart contracts that optimize gas fees, liquidity allocation, and governance processes based on real-time analytics.
- AI-Driven Risk and Fraud Detection: Onyx could implement on-chain AI security models to identify malicious transactions, front-running behavior, and fraudulent activity within DeFi applications.
- Decentralized AI Computation Marketplaces: A proposed AI marketplace could allow developers to train and deploy AI models on-chain, unlocking new capabilities for machine learning-driven financial applications.
- Automated Portfolio Management for Onyx-Based Assets: AI-based strategies could enable automated staking, asset allocation, and dynamic risk adjustment in Onyx-native DeFi applications.
- Predictive Blockchain Scaling: AI-enhanced network monitoring and congestion forecasting could dynamically optimize rollup configurations to prevent bottlenecks and maximize throughput.

6.4 Parallel Processing and High-Throughput Enhancements

As demand for scalable decentralized applications grows, Onyx is considering the implementation of parallel transaction processing and execution mechanisms to significantly increase transactions per second (TPS).

Potential High-Throughput Solutions for Onyx:

- **State Sharding for Layer 3 Rollups**: Onyx is researching state sharding models that divide storage and computation tasks across multiple processing nodes, preventing bottlenecks in execution.
- **Optimized Sequencing Mechanisms**: The development of advanced transaction sequencing techniques could improve the efficiency of rollup processing, allowing more transactions to be batched per block.
- **Layer 3-Specific Virtual Machine Enhancements**: A possible upgrade to Onyx's execution environment could introduce customized virtual machine optimizations, reducing gas consumption and improving transaction finality.

These enhancements are designed to position Onyx as a next-generation blockchain solution, capable of handling enterprise-grade applications, DeFi scaling, and AI-driven decentralized automation.

7. Conclusion.

Onyx Layer 3 blockchain is engineered to redefine scalability, efficiency, and interoperability within decentralized ecosystems. Built on Arbitrum Orbit and leveraging Base Layer 2 as the settlement layer, Onyx optimizes transaction throughput and cost-effectiveness while maintaining Ethereum's robust security framework. By integrating AnyTrust for data availability, Onyx ensures efficient storage and retrieval of transaction data without overburdening Ethereum's Layer 1, significantly reducing operational costs.

The architecture of Onyx is designed for performance and adaptability. Onyx's execution environment, powered by Arbitrum Nitro, ensures full EVM compatibility, allowing seamless deployment of smart contracts while benefiting from enhanced compression and fraud-proof mechanisms. Onyx also implements EIP-1559, introducing a predictable gas fee model with XCN as its native gas token, ensuring economic stability while incentivizing network participants through staking rewards and governance mechanisms.

XCN plays a pivotal role in Onyx's economic and governance structure. As the native gas token, XCN facilitates transaction execution, smart contract computation, and network operations within the Onyx ecosystem. The Onyx DAO empowers XCN holders with governance rights, allowing them to propose and vote on protocol upgrades, fee structures, and treasury allocations. Staking XCN not only grants governance power but also provides staking rewards, reinforcing long-term engagement and alignment with the network's security and sustainability. Furthermore, Onyx's integration with bridging solutions such as Superbridge and Wormhole ensures that XCN maintains cross-chain liquidity, enhancing its usability across Ethereum, Binance Smart Chain, Base, and Onyx Layer 3.

The ecosystem surrounding Onyx is built for broad adoption, integrating essential tools such as Privy for privacy management, Superbridge for multi-chain interoperability, Tenderly for smart contract monitoring, and Thirdweb for Web3 development. Additionally, bridged USDC ensures stablecoin liquidity within the network, supporting various financial applications, while partnerships with Decent enable scalable NFT and digital asset infrastructures.

As a Layer 3 network, Onyx is optimized for institutional adoption and enterprise-level solutions, enabling customized permissioned environments through sub-chain deployments. With a technical foundation that prioritizes security, economic sustainability, and high-performance execution, Onyx is positioned to be a leading infrastructure for the next generation of decentralized applications, financial systems, and blockchain-based innovation.

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