Cardano: A Comprehensive Overview

This document provides a detailed overview of the Cardano blockchain platform, intended for use in training a chatbot's vector database. It covers fundamental concepts, architecture, key features, and future developments.

1. Introduction to Cardano

- **1.1 What is Cardano?**
  - Cardano is a decentralized third-generation proof-of-stake blockchain platform and home to the ada cryptocurrency. It is the first blockchain platform to evolve out of a scientific philosophy and a research-first driven approach.
  - The Cardano platform has been designed from the ground up and verified by an industry-leading combination of top engineers and academic experts in the fields of blockchain and cryptography. It has a strong focus on sustainability, scalability, and transparency.
  - It is a fully open-source project that aims to deliver an inclusive, fair, and resilient infrastructure for financial and social applications on a global scale. One of its primary goals is to bring reliable, secure financial services to those people who do not currently have access.
  - Vision and mission.
- **1.2 History and Development**
  - Founding and key milestones.
  - Role of IOHK, Cardano Foundation, and Emurgo.
- **1.3 Why Cardano?**
  - Unique selling propositions (USPs).
  - Comparison with other blockchain platforms (e.g., Ethereum).
- **1.4 Cardano Developer Portal**
  - For those interested in building tools on Cardano, integrating with Cardano, and connecting with the wider developer community, the Cardano Developer Portal serves as a central resource. It provides explanations of core concepts and links to technical tutorials and documentation.

2. Core Principles and Philosophy

- **2.1 Research-Driven Approach**
  - Emphasis on peer-reviewed academic research.
  - Formal verification methods.
  - Cardano is written in Haskell, a functional programming language. This encourages building systems using pure functions, leading to components

that conveniently testable in isolation. Haskell's advanced features enable powerful methods for ensuring code correctness, such as basing implementation on formal and executable specifications, extensive property-based testing, and running tests in simulation.

- **2.2 Sustainability and Governance**
  - Treasury system.
  - Project Catalyst.
  - **2.2.1 Governance Actions**
    - Cardano's governance model involves various types of governance actions, each subject to specific voting requirements and thresholds. The Cardano Foundation has developed flowcharts to simplify understanding of these processes, aiming to enhance transparency and encourage broader community participation in shaping Cardano's future. These actions are crucial for the evolution and adaptation of the blockchain.
- **2.3 Scalability, Interoperability, and Sustainability (SIS)**
  - Explanation of these core goals.

3. Technical Architecture

- **3.1 Layered Architecture**
  - **3.1.1 Settlement Layer (CSL)**
    - Purpose: ADA transactions.
    - Key components.
  - **3.1.2 Computation Layer (CCL)**
    - Purpose: Smart contracts, dApps.
    - Key components.
- **3.2 Ouroboros Consensus Protocol**
  - **3.2.1 Proof-of-Stake (PoS)**
    - Proof of Stake (PoS) is a consensus mechanism that determines consensus based on the amount of 'stake' (or value) held in the system. It governs the rules and parameters for blockchain behavior, allowing distributed network participants to agree on the history of the network. Cardano is built on the groundbreaking PoS consensus protocol Ouroboros, which was the first blockchain consensus protocol developed through peer-reviewed research.
    - **How it differs from Proof-of-Work (PoW):** In contrast, Proof of Work (PoW) is a synchronous protocol where miners compete to solve computational problems to add new blocks, incentivized by rewards. This approach leads to increased electricity usage and longer processing times, slowing down the network and making it costly to maintain. PoS,

however, is significantly more energy-efficient, requiring less electricity and hardware resources.
        - **Features of Proof of Stake:** As a user's stake increases, their opportunity to maintain the ledger also increases, leading to a higher chance of producing new blocks. The creator of a new block is chosen based on a combination of random selection and their stake. Participants accumulate transaction fees, encouraging steady and stable growth and reducing stalled transactions.
        - **Primary advantages of PoS:**
            - Rigorous security protocols.
            - Reduced centralization by issuing penalties for selfish practices.
            - Energy efficiency due to lower electricity and hardware requirements.
            - Cost efficiencies compared to PoW protocols.
    - **3.2.2 Ouroboros Family (Praos, Genesis, Chronos, Leios)**
        - Ouroboros, named after the ancient symbol of a snake eating its own tail, represents the infinite and ethical growth and scalability of the blockchain. It is the first provably secure proof-of-stake protocol and is based on peer-reviewed research. Ouroboros selects participants, specifically stake pools, to create new blocks based on their stake in the network, facilitating the creation of distributed, permissionless networks. Different versions of Ouroboros exist, including Classic, BFT, Praos, Genesis, Crypsinous, Chronos, and Leios, each with its own improvements and features.
    - **3.2.3 Consensus Explained**
        - Consensus is the process by which all participants in a blockchain network agree on the current state of the ledger. The consensus protocol dictates how individual nodes assess the ledger's state and reach this agreement. Cardano's Ouroboros protocol achieves consensus by selecting stake pools to create new blocks based on the stake they control. Time on Cardano is divided into epochs, which are further divided into slots. A slot leader is elected for each slot, responsible for adding a block to the chain and passing it to the next slot leader.
- **3.3 UTXO Model (Extended UTXO - EUTXO)**
    - The Extended UTXO (EUTXO) model is an innovative model implemented by Cardano, which extends the UTXO model to support multi-assets and smart contracts. The EUTXO model generalizes the concept of 'address' so that addresses can contain arbitrary logic in the form of scripts. It also allows outputs to carry data in addition to an address and value. This model provides a secure and versatile environment to process multiple operations without

system failures and offers better scalability and privacy.

- **Six Reasons Why EUTXO Wins:**
  1. **Predictable Transactions:** Users know exactly what a transaction will do before submitting it, eliminating unexpected outcomes and failed transaction fees.
  2. **Predictable Transaction Costs and Resource Usage:** Transaction fees and resource usage can be accurately calculated beforehand.
  3. **Concurrency and Scalability:** Transactions that consume different inputs can be processed simultaneously, enhancing throughput and scalability.
  4. **Improved Security:** Determinism and locality reduce potential attack vectors and simplify reasoning about smart contract security.
  5. **Improved Flexibility:** The EUTXO model allows for the creation of new architectures and ways of doing things that are not possible with the account-based model.
  6. **Best Choice for Zero-Knowledge Proofs:** EUTXO's transaction predictability makes it ideal for zero-knowledge proofs, enabling complex computations to be performed off-chain with on-chain verification.

- **3.4 Foundational Blockchain Concepts**
  - **3.4.1 What is a Blockchain?**
    - A blockchain is a type of database or ledger that is duplicated and distributed to all participants within the blockchain network. It is made up of a set of interconnected nodes that store data or items of value in blocks. These blocks are validated, cryptographically secured, and linked to each other in chronological order in a chain. The information stored in the validated blocks of the blockchain cannot be altered later on; it is permanently inscribed in the distributed ledger.
    - Blockchain technology, also known as distributed ledger technology (DLT), provides a decentralized and accessible data structure for various records, including financial payments, transactions, commerce data, and Internet of Things (IoT) records. Its decentralized nature means it is independent of centralized controlling entities or middlemen, enhancing transparency of data storage and management. A crucial feature is immutability, meaning records cannot be changed, forged, or deleted without breaking the chain.
  - **3.4.2 What is a Cryptocurrency?**
    - A cryptocurrency (or crypto) is a digital asset, stored on a ledger, designed to serve as a medium of exchange for goods or services. Blockchain ledgers serve as the underlying technology for cryptocurrency

creation in a decentralized environment. Blockchain protocols use rigorous cryptography techniques to enable the minting (creation) of cryptocurrency and to secure and verify crypto ownership and fund movement records. The price of cryptocurrency is not controlled by a government or centralized financial institution; it is defined by its value, correlation to real-world figures, and is driven by market supply and demand.
        - Addresses, unique identifiers represented by a string of numbers and letters derived from a user's public keys, are used when sending cryptocurrency payments.
- **3.5 Cardano Nodes**
    - The Cardano node is the top-level component within the network. Network nodes connect to each other within the networking layer, which drives information exchange, including new block diffusion and transaction information, to establish better data flow. Cardano nodes maintain connections with peers chosen via a custom peer-selection process. By running a Cardano node, you participate in and contribute to the network.
- **3.6 Confirmation Mechanisms**
    - **3.6.1 Chain Confirmation vs. Transaction Confirmation**
        - **Chain Confirmation:** Occurs when the Ouroboros protocol guarantees that the chain will not change due to randomness. This happens after a certain number of future 'k' blocks have been created. The 'stability window' is the time between the present and when chain confirmation occurs for a transaction.
        - **Transaction Confirmation:** This is when a transaction is accepted into the chain and becomes immutable. 'Block depth' and 'settlement window' are important here. A transaction is confirmed if the block containing it is deep enough in the chain (meaning enough blocks have been added since that block). The settlement window is the time between transaction confirmation and when the transaction's assets can be used. Alternatively, transaction confirmation can be determined by the increasing likelihood of immutability as more blocks are added since the transaction was accepted, with confirmation occurring when this probability is sufficiently high.

4. Key Features and Components

- **4.1 ADA Cryptocurrency**
    - Purpose and utility.
    - Tokenomics.

    - Ada is the native, or principal currency on Cardano. It is the main payment unit on Cardano, accepted as fee-payment, for deposits, and is the only currency in which rewards are distributed.
    - Lovelace is the smallest denomination of ada. One ada = 1,000,000 lovelaces. Ada has six decimal places, making it easily divisible into smaller fractions.
- **4.2 Staking and Delegation**
    - **How Staking Works:** Ada held on Cardano represents a holder's stake in the protocol, proportional to the amount held. Holders can earn passive rewards for validating blocks.
    - **Role of Stake Pools:** At the heart of the Ouroboros protocol are stake pools, reliable server nodes run by a stake pool operator to which ada holders can delegate their stake. Stake pools ensure that everyone can participate in the protocol, regardless of technical experience or availability to keep a node running. These stake pools focus on maintenance and hold the combined stake of various stakeholders in a single entity. Stake pools process transactions and produce new blocks and are at the core of Ouroboros. Ouroboros relies on stake pools to ensure a good number of stakeholders are online with good network connectivity. Stake pool operators install and run software, while delegators delegate their stake to the pool. Stake pool operators are rewarded for running the protocol through transaction fees and inflation of the circulating ada supply.
    - **How to Delegate:** Since not everyone can run a stake pool, ada holders can delegate their stake to a preferred pool, allowing participation in consensus and earning rewards without continuous node operation. The higher the stake in a pool, the more rewards are assigned to its owners. Ada holders can delegate their stake using various ecosystem wallets. Delegation is a mechanism inherent in the Ouroboros protocol that allows the protocol to scale even in a setting where the set of stakeholders might be highly fragmented. Anyone who owns ada can participate in stake delegation while retaining their spending power. Stake delegation gives rise to stake pools that act similarly to mining pools in the Bitcoin protocol. There are three options ada holders can consider for delegating their stake: run their own stake pool, agree with a third party to run a private stake pool for them, or delegate to other stake pools. With the concept of delegation, any stakeholder can allow a stake pool to generate blocks for the Cardano network, and then the protocol will distribute the rewards to all participants, including the fees for the SPO.
    - **Pledging and Rewards:** Pledging in Cardano encourages healthy ecosystem growth. When registering a stake pool, operators can pledge ADA to attract

delegators, as higher pledges correlate with higher rewards. The a0 protocol parameter influences the pledge on pool reward distribution. Rewards are distributed each epoch to stakeholders delegating to stake pools and are auto-generated by the protocol from transaction fees and monetary expansion. The reward mechanism involves a formula considering total available rewards, pledge influence factor, relative pool saturation size, stake delegated, and stake pledged.

    - **Staking Calculator:** The Cardano staking calculator is a tool that predicts the approximate rewards a user may receive by delegating ADA to a stake pool. The rewards predicted by this calculator are only an estimate and may vary depending on factors such as actual stake pool performance and changes to network parameters. The annualized equivalent returns assume stake is delegated to the same stake pool for a 365-day period, with consistent stake pool performance and settings.

- **4.3 Smart Contracts**
    - **4.3.1 Plutus**
        - **What is Plutus?** Plutus is Cardano's native smart contract platform.
        - Cardano's smart contract platform seeks to deliver more advanced features than any protocol previously developed and will serve as a stable and secure platform for the development of enterprise-level DApps.
        - Use cases and benefits.
    - **4.3.2 Marlowe**
        - Marlowe is a domain-specific language (DSL) for financial contracts on Cardano, designed to be accessible to a broader audience without deep programming expertise. It allows users to build financial applications and smart contracts directly on the blockchain.
    - **4.3.3 Aiken**
        - Aiken is a modern programming language and toolchain specifically designed for developing smart contracts (on-chain validator scripts) on the Cardano blockchain. It draws inspiration from languages like Gleam, Rust, and Elm, and its scripts compile down to Untyped Plutus Core (UPLC).
- **4.4 Native Tokens and Multi-Asset Ledger**
    - Cardano supports the creation of native tokens — digital assets created for specific purposes. This means users, developers, and businesses can use the Cardano blockchain to create tokens that represent a footprint of value (whether defined by the community, market state, or self-governed entity). A token can be fungible (interchangeable) or non-fungible (unique), and act as a payment unit, reward, trading asset, or information holder.

    - For more detailed information on working with native tokens, users can refer to the developer portal native token tutorials and ledger explanations about native tokens.
    - Benefits and examples.
    - Enables solutions like "Originate" for verifiable authenticity (see Section 6.5).
- **4.5 Decentralized Applications (dApps)**
    - Ecosystem overview.
- **4.6 Wallets (Daedalus, Yoroi)**
    - A blockchain wallet is a safe and secure place where users can keep their digital assets. It's crucial to store digital assets in a wallet where you control the private keys (the password granting access to your assets), as storing them on exchanges is highly discouraged.
    - Technically, assets are not stored in the wallet; their records live on the blockchain and are accessed using unique private keys, which grant the right to make transactions. Losing your private keys means losing access to your digital assets, so it is crucial to keep them safe and offline.
    - Wallets come in different forms, varying in security and supported functionality.
    - **Types of Wallets:**
        - **Paper wallets:** Paper documents containing public and private key details. Highly secure as they are offline, best for long-term savings, but assets cannot be operated online without moving them first.
        - **Hardware wallets:** Devices that store digital assets offline and connect to a computer for access. They offer a balance of offline security and convenience, but carry the risk of device loss or damage. Examples for ADA include Trezor Model T, Ledger Nano S Plus, and Ledger Nano X.
        - **Online wallets:** Commonly set up via a browser, operating through the internet and storing assets in an application or software. Convenient for sending, receiving, and using assets like a bank account, but more susceptible to online security issues. Users should search for secure options, keep keys offline, and use 2FA verification (preferably security keys over SMS).
        - **Desktop wallets:** Downloadable applications for personal computer. Secure and convenient, but require meeting software requirements and checking asset support. Less flexible or portable than mobile options.
        - **Mobile wallets:** Smartphone applications that are simple to install and use, serving as a good additional option for digital asset storage.
    - **Where to store ADA?**
        - **Daedalus:** A full node, desktop wallet that downloads and independently

validates a full copy of the Cardano blockchain. This provides maximum security and trustless operation. Features include easy installation, locally stored wallets and encrypted private keys, trustless operation, support for the Ouroboros protocol, wallet backup/restoration, staking/delegation support, voting support, and a paper wallet generator.
        - **Daedalus Installation:**
            1. Read system requirements (Daedalus is resource-intensive; for quick management, consider Lace, Nami, Yoroi, or others).
            2. Visit the official Daedalus website.
            3. Follow the provided installation instructions.
    - **Other Options:** Lace, Nami, Eternl, GeroWallet, Typhon, Ellipal, AdaLite, Infinito Wallet, Atomic Wallet, Guarda, Tangem, SimpleHold Wallet, Coin Wallet, NuFi, NOW Wallet.
- **4.7 Cardano Tracking Tools**
    - Since Cardano is a public blockchain ledger, all recent transactions, block details, and epoch data can be easily tracked using various tools.
    - **Exploring Transactions and Blocks (Cardano Explorers):**
        - A list of available Cardano explorers provides user-oriented tools that fetch data from the main database and display it in a straightforward web interface.
        - Explorers typically show epoch details, including:
            - Number of blocks produced during the epoch.
            - Time the epoch started.
            - Time of the last produced block.
            - Number of processed transactions.
            - Total output in ADA.
        - Specific blocks can be explored for details like ID, size, epoch/block details, number of included transactions, and confirmations. Users can also search for specific epochs, transactions, or blocks by pasting their IDs.
    - **Exploring Assets:**
        - Cardano supports multi-asset creation and management. Tools to see a list of created assets and tokens include:
            - AdaStat (tokens)
            - Cardano Assets
            - Cardanoscan (tokens)
            - Pool.pm (tokens)
            - Cexplorer (tokens)
    - **Exploring Stake Pools:**

        - To find a list of all registered stake pools, their tickers, pool names, and IDs, users can use these tools:
            - Cardano PoolTool
            - Cardanoscan (pools)
            - Pool.pm (pools)
- **4.8 Cardano Keys and Addresses**
    - **Cardano Keys:** These are asymmetric cryptography key pairs used for signing and validating payments and staking certificates, as well as identifying and defining addresses on the Cardano blockchain. There are two main key types:
        - **Node Keys:** Represent the security of the blockchain and consist of operator/operational key, KES key pair, and VRF keys.
        - **Address Keys:** Represent the functions of the addresses derived from the keys for identifying funds on the blockchain and consist of payment key and staking key.
    - **Cardano Addresses:** Shelley introduced four different types of addresses:
        - **Base addresses:** Directly specify the staking key that should control the stake for that address.
        - **Pointer addresses:** Indirectly specify the staking key that should control the stake for the address.
        - **Enterprise addresses:** Carry no stake rights, meaning using these addresses opts out of participation in the proof-of-stake protocol.
        - **Reward account addresses:** Used to distribute rewards for participating in the proof-of-stake protocol.
- **4.9 Transaction Types**
    - Cardano facilitates various transaction types, often allowing them to be combined for complex operations.
    - **Minting Transactions:** Allow users to create and manage custom tokens. This involves defining minting and burning rules (e.g., using Plutus policy scripts or multi-signature scripts) and building the transaction with the new token's details.
    - **Staking Transactions:** Enable users to delegate ADA to stake pools and earn rewards. This process involves generating stake key pairs, creating registration and delegation certificates, and signing the transaction with both payment and stake keys.
    - **Withdrawing Transactions:** Used to claim rewards accumulated in a stake address. This transaction requires available rewards and some ADA for fees, and it must be signed with the stake.skey file.
    - **Redelegation Transactions:** Allow users to switch their delegated stake from one stake pool to another. This involves creating a new delegation certificate

with the new stake pool's ID, building, signing, and submitting the transaction.
    - **Multiple Purposes Transactions:** Cardano supports combining various transaction types into a single, complex transaction. Examples include withdrawing funds from a script, minting a token, withdrawing delegated funds, and setting metadata within one transaction.

5. Development Phases (Eras)

- **5.1 Byron (Foundation)**
- **5.2 Shelley (Decentralization)**
- **5.3 Goguen (Smart Contracts)**
- **5.4 Basho (Scaling)**
- **5.5 Voltaire (Governance)**
    - The Voltaire era focuses on establishing a fully decentralized governance system. This includes the implementation of CIP-1694, which defines the on-chain governance model.
    - **Constitutional Committee (CC):** A key component of Cardano's governance is the Constitutional Committee, responsible for reviewing and ensuring the constitutionality of governance actions. Elections for the seven CC seats are facilitated by Intersect, with candidates assessed by entities like the Cardano Foundation based on criteria such as Constitutional & Governance Acumen, Technical Competency, Impartiality, Long-Term Commitment, and Communication Skills. The Cardano Foundation actively participates in voting for CC candidates.
    - **Governance Action Voting:** The Cardano Foundation has developed comprehensive flowcharts to simplify the voting process for various governance actions, aiming to increase accessibility and transparency for all community members. These charts illustrate the voting requirements and conditions for actions to pass, based on existing thresholds, and will be updated as governance parameters evolve.

6. Ecosystem and Use Cases

- **6.1 DeFi on Cardano**
    - **P2P DeFi:** A shift towards peer-to-peer decentralized finance (P2P DeFi) is advocated for a more scalable, efficient, and accessible system on Cardano. P2P DeFi enables direct financial interactions between individuals without intermediaries, ensuring user control, security, and transparency via blockchain. While current DeFi models on Cardano face challenges like high transaction costs, scalability issues, and liquidity problems, a layered approach to dApp design and managing UTXO contention through free

markets (allowing users to pay for exclusive UTXO access) are proposed solutions. Four P2P DeFi protocols (Order book, Credit market, Options trading, and Aftermarket) are designed to work as a foundational ecosystem.
    - **FluidTokens:** This platform unlocks liquidity within the Cardano ecosystem by enabling users to access instant, unspendable loans utilizing Cardano's staking mechanism, ensuring security and convenience for both borrowers and lenders. FluidTokens is developing partnerships (e.g., with Minswap for a DEX for programmable tokens) and plans for future cross-chain integration and ZK P2P loans. It leverages Cardano's technology by building smart contracts with Aiken and MeshJs for a seamless user experience, with security measures including audits with firms like Vacuum Labs and Anastasia Labs.
- **6.2 NFTs on Cardano**
- **6.3 Gaming and Metaverse**
- **6.4 Supply Chain and Identity Solutions**
- **6.5 Real-world Applications**
    - **Originate:** The Cardano Foundation has introduced Originate, an open-source traceability infrastructure. This solution is designed to provide verifiable authenticity for products and support industry certifications across diverse industries. It leverages Cardano's security, resilience, and scalability to offer a cost-effective and customizable foundation for enhancing trust and expanding into new markets. Originate centralizes inventory, data, and processes, simplifying product and industry certificate verification. A notable demonstration of its capabilities is the Georgian Wine project.
    - **Reeve:** Reeve is a next-generation accountability tool that integrates traditional accounting systems with blockchain technology to deliver tamper-proof and transparent financial insights. Built on Cardano, it ensures transparency, immutability, and security for financial records. Designed for accountants, auditors, non-profits, and enterprises, Reeve helps streamline audits, improve efficiency, and build trust in financial processes.

7. Future Developments and Roadmap

- **7.1 Hydra (Layer 2 Scaling)**
    - Hydra is a layer 2 scaling solution for Cardano. It increases transaction throughput and ensures cost efficiency while maintaining rigorous security. Hydra Head is the first protocol of the Hydra family of protocols and embodies the foundation for more advanced deployment scenarios relying on isomorphic, multi-party state channels. Developers can use Hydra Heads to add specialized, complex protocols on top of Cardano.

- **7.2 Midnight (Privacy Sidechain)**
- **7.3 Partner Chains**
- **7.4 Interoperability Solutions**
  - **Inter-Blockchain Communication (IBC) Bridge:** The Cosmos-Cardano Inter-Blockchain Communication (IBC) bridge project aims to enable seamless communication between these two blockchain ecosystems. It involves the IBC protocol, blockchain interoperability, and the integration of Cosmos SDK with Cardano. This allows for real-world use cases like token transfers and cross-chain swaps, demonstrated by sending messages between the Cosmos network and a local Cardano node.
- **7.5 Scalability Solutions**
  - **Mithril:** Mithril is a stake-based multi-signature scheme that leverages the existing Cardano network to provide certified snapshots of all or part of the blockchain state. These snapshots are useful for various use cases, including secure voting, data exchange, and synchronization between applications, sidechains, and light wallets. Its first application enables faster bootstrapping of Cardano nodes, allowing nodes to start from a predefined state with the same security guarantees as the chain itself, but much more quickly.

8. Community and Resources

- **8.1 Official Websites and Social Media**
- **8.2 Developer Resources**
  - **Cardano Ecosystem Engineering:** Ecosystem engineering supports Cardano's growth through DevOps practices focusing on scalability, security, and uptime. It addresses the challenges of running decentralized infrastructure and contributes to infrastructure evolution and global adoption.
  - **Java Tooling for dApps Development:** Java tools are available for building on Cardano, including `cardano-client-lib` for writing off-chain code, building transactions, and integrating governance and staking. Tools like Yaci DevKit (for local development environments) and Yaci Store (for indexing) are also available to help build lightweight applications using tailored data.
- **8.3 Educational Materials**

9. Glossary of Terms

- Definitions of key Cardano-specific terminology.

10. Testnet Environments and Tools

- **10.1 Testnet Environments**
  - Cardano testnet environments provide sandboxed environments for

continuous innovation and improvement, separate from the Cardano mainnet. Stake pool operators, exchanges, smart contract developers, and projects can use these networks to test core Cardano functionality before deploying on the mainnet.
    - Available testnet environments include:
        - **Preview:** For testing release candidates and expanded test scenarios.
        - **Pre-production:** The most mature testing network, closely resembling the production (mainnet) environment.
        - **Production (Mainnet):** The live network featuring official functionality releases.
- **10.2 Getting Started with Cardano Testnets**
    - To join and start using Cardano testnets, users need to:
        - Install and configure the Cardano node and the command-line interface (CLI).
        - Configure their testing environment.
        - Generate payment keys and addresses.
        - Obtain test ADA to test transactions (these tokens have no real-world value).
    - The Cardano node can run on various operating systems, including Linux (Ubuntu 19.10+, Mint 19.3+, Debian 10.3+), MacOSX 10.14.0+, and Windows 10. Correct setup of node configuration, genesis, and topology files is essential.
- **10.3 Creating a Local Testnet**
    - Developers and projects can create local testnets to test new features or functionality privately before deploying on global testnet environments.
    - Methods for creating a local testnet include:
        - **Plutip:** A tool developed on the Cardano blockchain that facilitates the creation of a private network to run Plutus contracts. It can be used with an executable setup for starting a private network and funding wallets, or with a modified setup for hard forks.
        - **Nix:** A tool for package management and system configuration, which can be used to spin up a local testnet.
- **10.4 Testnets Faucet**
    - The Cardano testnets are independent networks and require their own tokens. The faucet is a web-based service that provides test ADA to users of the Cardano testnets. These tokens allow users to experiment with Cardano testnet features without spending real ADA on the mainnet. To request tokens, users select the desired action type, enter the account address, and click "Receive test ada." Funds typically appear in the specified testnet account within a few minutes.

- **10.5 Daedalus Wallet for Cardano Testnets**
    - Daedalus wallet is available for use with Cardano testnets, providing a full-node experience for testing purposes.