TRIE: A decentralized, verifiable Intelligence marketplace for data, models and machines

Abstract: Artificial Intelligence (AI) is reshaping industries and driving innovation, yet its benefits remain concentrated among a few entities, creating inequities and stifling broader participation. The TRIE protocol addresses these challenges by building a decentralized marketplace powered by blockchain, enabling independent contributors to securely monetize data and AI models. By replacing centralized intermediaries with transparent smart contracts, TRIE ensures verifiability, privacy, and trust across its ecosystem.

The integration of decentralized infrastructure, AI assets, and blockchain technology in TRIE creates a collaborative platform where data providers, developers, and infrastructure providers can interact seamlessly. This framework democratizes access to critical resources, including computational power, high-quality data, and financial rewards, fostering innovation while reducing barriers. TRIE's vision is to create an inclusive AI-driven economy that redistributes ownership, accelerates innovation, and ensures fair opportunities for all stakeholders.

1. Introduction

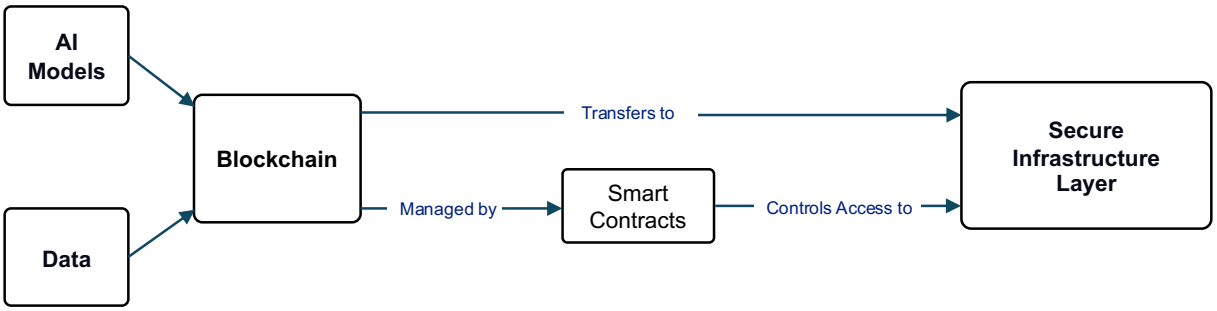
Artificial Intelligence (AI) has become one of the most transformative technologies of our time, driving innovation, reshaping industries and creating unprecedented opportunities. However, the wealth and control generated by AI have largely been concentrated in the hands of a few powerful corporations and individuals, leaving the broader community with limited access to its benefits. This centralization slows down innovation, creates inequities and limits the potential for AI to address global challenges equitably. There is huge potential in democratizing AI—breaking down barriers, redistributing access and ownership and fostering open collaboration to ensure that its transformative power is harnessed for the benefit of all in a distributed and verifiable way. Currently, it is well understood that vast amounts of data are generated by trillions of devices worldwide. However, what is less recognized is that the proportion of independent contributors and small communities developing AI and machine learning (ML) models is even greater. The core problem addressed by the TRIE protocol is the lack of a platform that enables independent data providers and model creators to monetize their contributions and receive equitable rewards for their individual contributions.

Creating such an environment in the traditional web model is challenging due to the reliance on intermediaries, which often evolve into dominant entities, becoming the primary beneficiaries. In applications centered on the ownership economy, there is a critical need for an unbiased intermediary whose sole function is to enforce and guarantee pre-defined rules. Blockchain, a rapidly evolving technology, addresses this need by providing a cryptographically secure, decentralized intermediary, replacing trust in centralized servers with algorithmic trust. By leveraging smart contracts for data sharing and ensuring end-to-end verifiability of the data supply chain, a secure and efficient blockchain protocol can enable a fine-grained, transparent data-sharing platform. This not only enhances the credibility of data for consumers by preventing

the inclusion of synthetic data but also supports the AI developer community. By utilizing personally identifiable information (PII)-hidden, natural user data for training, developers can create more robust and reliable AI models.

The third group of beneficiaries in TRIE comprises infrastructure providers. These include traditional public and private cloud storage providers, Decentralized Physical Infrastructure Networks (DePIN) and secure execution environment providers.

They play a crucial role by offering computational resources to the community and creating decentralized storage enclaves for data sellers and aggregators. By enabling secure and efficient storage and computation, these providers play a key part in the marketplace by supporting storage and compute services while empowering asset sovereignty in the ecosystem. This powerful combination of AI assets, blockchain and infra will eradicate the unequal access to critical assets such as computational power, high-quality data and most importantly financial rewards.



2. Rubix Chain

Choosing a blockchain protocol is the most essential part for such a decentralized AI marketplace. The protocol should be operationally efficient, able to handle millions of updates per day. The ability to allow seamless collaboration of AI assets across participants is also another key component. Handling sensitive information such as user data and copyright models will require security of strong cryptographic privacy preserving algorithms.

Rubix fits into the decentralized AI ecosystem by addressing several key challenges that other blockchain platforms or centralized AI infrastructures often struggle to resolve. Its modular architecture and low-cost infrastructure make it particularly suitable for decentralized AI applications, enabling smaller players to participate meaningfully in the AI revolution while ensuring trust and transparency across the ecosystem.

- **Privacy and Data Security**
  - **Decentralized Identity (DID):** Rubix enables users to create self-owned identities and obtain tamper-proof, verifiable claims, ensuring data integrity and privacy.
  - **Secure Asset Collaborations**: Rubix WASM based smart contracts support to cryptographic libraries ensures that sensitive AI data and models can be securely shared among applications.

- **Scalability**
  - **Zero Gas Fees:** Rubix eliminates transaction costs, making it economically viable for smaller contributors in the AI ecosystem to participate and monetize their data or models without being burdened by fees.
  - **High-Speed Transactions:** Rubix supports near instant transaction finality, enabling seamless interactions for AI data sharing, training and model deployment without bottlenecks.
  - **Scale on Demand:** Rubix is the only blockchain that can auto scale as per requirement. Rubix does not have a software cap on how many transactions it can support in parallel. Applications can increase or decrease their hardware limit as per requirement making Rubix a perfect fit for real world businesses.
  - **Modular Architecture:** Enterprises can create dedicated block spaces, tailoring the blockchain to specific AI applications, whether for training datasets, model sharing, or deployment. This enables providers to join or create new subnets at a fraction of cost when compared to some of the existing protocols that have limited Blockspace and subnets.

- **Integration with AI Workflows**
  - **Seamless Collaboration:** Rubix smart contracts are built in traditional web languages and hence facilitate decentralized collaboration.
  - **Interoperability:** It can integrate with decentralized AI protocols and existing AI infrastructure, allowing Rubix to be a foundational layer for DeAI ecosystems.

3. TRIE marketplace Design

The core principle of TRIE is to enable an open marketplace for AI assets through a verifiable, privacy preserving decentralized platform. The primary economic incentives for participants are through TRIE Coins (TRIE) created as secondary Coins of Rubix native token (RBT). More on this will be explained in Tokenomics section.

In a decentralized AI marketplace, the participants play specific roles tailored to the ecosystem's needs for AI models, data and computational resources. Here's a breakdown

- **AI Model Providers**
  - Offer AI models (e.g., pretrained models, APIs) for tasks like computer vision, NLP, or predictive analytics.
  - Can be individuals, research institutions, or companies specializing in AI development.

- **Data Providers**
  - Supply datasets required to train, fine-tune, or evaluate AI models.
  - May include:
    - **Raw data providers:** Offer unprocessed data.
    - **Curated data providers:** Deliver cleaned and labeled datasets.

- **Buyers/End Users**
  - Seek AI solutions for their specific needs, such as automation, analytics, or innovation.
  - Types:
    - **Developers:** Integrate marketplace tools into applications.
    - **Businesses:** Use AI to optimize operations or enhance products.
    - **Researchers:** Access AI models or datasets for academic purposes.

- **Computational Resource Providers**
  - Offer cloud or edge computing resources to train or deploy AI models.
  - Examples:
    - **Cloud providers:** Large-scale services like AWS, Google Cloud, or Azure.
    - **Decentralized computing platforms:** Enable distributed resource sharing.

- **TRIE Coin holders**
  - Participate in decentralized governance or pledging mechanisms as validators.
  - Examples:
    - **Node operators:** Maintain the blockchain or distributed ledger.
    - **Coin holders:** Invest or vote in governance

- **Community Members**
  - Contribute through feedback, peer reviews, or crowdsourcing activities.
  - Examples:
    - **Crowd annotators:** Label data to enhance model accuracy.
    - **Beta testers:** Evaluate AI models and provide insights.

- **Smart contract developers and builders**
  - Build tools, plugins and frameworks to integrate marketplace AI solutions into on chain applications.
  - Manage the platform that facilitates transactions, interaction and trust among participants.
  - Contribute with open-source libraries for cryptographic techniques required to enable collaboration

This diverse set of participants ensures a robust digital AI marketplace ecosystem, balancing innovation, scalability, ethics and usability.

4. TRIE: Example Workflow Scenario

Let's look at some workflow scenarios in this marketplace**,** where businesses, developers and researchers come together to buy, sell, or collaborate on face recognition.

- **AI Model Providers**
  - A startup, FaceRead, uploads a pretrained AI model for facial recognition.
  - FaceRead offers the model under a subscription or per-use fee

- **Data Providers**
  - A data company, Hummein, sells a high-quality, labeled dataset of anonymized human faces for model training.

- **Buyers/End Users**
  - RetailStoreCo, a chain of stores, needs facial recognition for customer analytics.
  - RetailStoreCo purchases FaceRead's model and Hummein's dataset to customize it for their in-store cameras.

- **Computational Resource Providers**
  - RetailStoreCo rents GPU resources from EcoInfra, a Rubix Decentralized Infra partner, to deploy and run the model efficiently and securely.

- **TRIE Coin holders**
  - TRIE Coin holders can vote on key decisions, such as platform upgrades, changes to transaction fees, or the addition of new features to face recognition.
  - Coin holders act as validators or delegate their Coins to validators to ensure the asset immutability and integrity.
  - TRIE Coins can provide discounts on fees or premium access to features by providing marketplace discounts to long term holders

- **Community Members**
  - Community members provide a detailed review for Hummein's dataset, helping other buyers make informed decisions.
  - An open legal community member ensures ethical use of the facial recognition technology. They receive incentives from dApp chain owners for services.
  - An independent auditing community will provide services to certify the model does not exhibit any racial or gender bias

- **Smart contract builders:** A Rubix dapp developer, Harry designs a toolkit for biometric verification using zero knowledge proofs. This library will be provided as an on-demand service to FaceRead to generate PII data. Through this collaboration:

  - RetailStoreCo gains a ready-to-use, ethically sound AI solution.
  - FaceRead , Hummein and EcoInfra monetize their products.
  - TRIEFace earns builds its reputation as a trusted marketplace.
  - Coin holders earn rewards by participating in activities like pledging, liquidity provision, or contributing to platform growth.

This showcases how diverse participants interact within a digital AI marketplace to meet varied needs and mutually benefit from a trustless open marketplace.

5. Tokenomics of TRIE Coin

TRIE Coins will be used for governance, ecosystem incentives, development and investors.

The **TRIE Coin** is for securing the transactions of the deAI network and is created from native token of Rubix network - RBT.

1 TRIE Coin = 1/1000 of RBT at the time of creation.

The TRIE foundation would have the following Coins at launch

Total Supply: 150 Mn TRIE coins

- 100 Mn circulating TRIE Coins and
- 50 Mn TRIE Coins securing the circulating Coins through Proof of Pledge consensus specific to this deAI marketplace/network.

New TRIE Coins minted through continuous pledge of these 50 Mn TRIE Coins would be held by the foundation. The minting of TRIE Coins would be tied into the level wise minting of new RBTs and would follow principles of proportionality.

- 1 RBT pledged for a week = 1 credit per validator* in the mainnet, 0.1 credit per validator in the subnet; 64 credits required to mint 1 new RBT at current level (4).
- 1RBT = 1000 Trie, 1000 TRIE pledged for a week = 1 credit per validator in the mainnet, 0.1 credit per validator in the subnet; 64 credits required to mint 1000 new TRIE Tokens at current level (4).
    - **Every quorum has 5 validators*

6. Key utility of TRIE Coin.

- **Peer-to-Peer Settlement & Exchange:**
    - Used as the primary currency for settling transactions within the ecosystem, enabling frictionless asset exchange between participants.
    - Acts as a universal medium of exchange across multiple subnets in the network.

- **Purchasing Third-Level NFTs (Subnet Shares):**
    - Third-level NFTs represent ownership of specific subnets.
    - TRIE Coin holders can purchase, trade, or stake these NFTs to gain voting rights, profit-sharing, and governance privileges within subnets

- **Incentivizing Early Network Participation:**
    - Early participants are rewarded with TRIE Coins for contributing resources (e.g., computational power, AI models, data sets)

- **Model and Data Review**
    - TRIE Coins can be purchased by subnet builders. Each subnet will be focused upon specific use cases and will have their own validation mechanisms built in. The models could be based on
        - **Peer Review:** Models and datasets can be reviewed by community members with relevant expertise.
        - **Reputation System / Committee verification:** Contributors can earn a reputation score based on the quality and accuracy of their evaluation
        - **Crowdsourced Evaluations**: Engage the community in testing and evaluating AI models or datasets for effectiveness, fairness, and ethical considerations.

7. Value Accrual Mechanism

The **TRIE Coin** derives its value through:

- **Utility Demand:**
  - The need for the Coin to settle transactions and purchase subnet shares creates constant demand.

- **Scarcity:**
  - Fixed and hard capped Coin supply (inherited from native token viz RBT) ensures scarcity, enhancing the token's value over time_

- **Profit Distribution:**
  - Holders of Entity Coins (purchased with TRIE Coins) receive a share of subnet profits, driving further demand for the Coin.

- **Staking and Validator Rewards:**
  - Validators lock TRIE Coins to secure the network, reducing circulating supply.

8. Early Adoption Coin Incentives

To promote early adoption and long-term participation:

- **Early Adopter Bonuses**: Users purchasing Third-Level NFTs early on receive additional rewards.
- **Staking Rewards**: Validators and long-term Coin holders receive staking rewards.
- **Subnet Incentives**: Subnets are incentivized to onboard more users by distributing TRIE Coins as rewards

9. TRIE Rewarding Mechanisms

On-Chain Reward Distribution: Smart contracts distribute rewards automatically based on pre-set metrics (e.g., model usage, performance benchmarks, dataset ratings)

Tiered Rewards

- Implement reward tiers based on contribution quality and community feedback:
  - **High Impact Contributions:** Models or datasets solving critical problems.
  - **Community Favorites:** Based on user votes and ratings.
  - **Underrepresented Areas:** Encourage diverse contributions with special rewards.

Dynamic Reward Pools: Adjust reward pools dynamically based on factors like network usage, community votes, or contributor performance.

10. Coin distribution

The 100 Mn circulating TRIE Coin distribution would be

- **TRIE Early Backer:** provide the necessary capital for early-stage development and expansion. 50% of initially mined TRIE Coins reserved for this purpose.
  This helps fund initial operations, such as infrastructure setup, team hiring and product launch and are dedicated for strategic investors who can provide expertise, networking opportunities, or market influence.

- **TRIE Development:** Coins allocated to this pool support building and maintaining the core technology, tools and infrastructure. 30% of 100 Mn TRIE Coins are reserved for strategic partnerships, developer community building and incentivizing core product TRIE Improvement Proposals (TIP)

- **TRIE Governance:** Since the application requires moderate to large level of decentralization to start with, 20% of coins will be reserved by the foundation for providing governance

11. TRIE Coins, Entity Coins and RBTs

TRIE marketplace built on Rubix can be structured with a layered Coin ecosystem, the roles of primary, secondary, and tertiary Coins to clearly enhance modularity and specialization.

The primary Coin RBT serves as the backbone of the L1 ecosystem. It functions as the main medium of settlement for transactions across the platform, pledging for consensus and governance decisions. RBT provides a stable and universal medium of exchange for users, developers, and stakeholders within Rubix universe.

Building on this, TRIE, introduces a more focused utility layer. TRIE is designed specifically to facilitate interactions with AI-related services, such as accessing machine learning models, paying for computational resources, trading datasets or subscribing to AI model usage plans. This Coin allows for a dedicated and scalable economic structure around AI services, enabling fair value distribution within this domain.

Additionally, Entity Coin can be created by enterprises, startups, applications or specialized tools within the ecosystem, allowing for application-specific Coins tailored to niche functionalities. For example, an Entity Coin SCHE can be launched by a startup for their virtual assistant for scheduling meetings. This allows SCHE subnet to provide specific rules and customizations at the app level.

The TRIE Coin facilitates commerce and security across the AI marketplace, which consists of several entities running their own subnet(s). The Entity Coin serves as the capital (debt or equity) coin. Investors can differently value the various entities on the AI marketplace, based on the team, solution, model or data offered. The Entity Coins themselves can only be purchased through TRIE Coins. All commerce on the platform between Entities happens using TRIE Coins. Each Entity Coin value can go up or down when measured in TRIE Coins based on various parameters.

The segregation of TRIE marketplace coin and the Entity Coins facilitates flexibility and scalability on the marketplace. Other AI focused blockchains reward subnets through platform Coins purely based on the subjective judgement of performance. Creating the Entity Level Coins makes it easier for AI startups, enterprises, academic institutions and data providers to build businesses on the TRIE platform instead of using current capital formation structures.

There is no limit to the number of Entities that can be set up on the TRIE marketplace. There is no limit to the number of Entity Coins each Entity can issue either. Entities are run by DAO governance rules which are specific to each entity. Creation of Entity Coins can be done through TRIE Coins only.

While any amount of Entity Coins can be treated without cost, issuance of these Entity Coins to investors will require pledging of TRIE Coins of the same value. So, creation of the Entity Coins requires the locking of TRIE Coins. When the Entity Coins are redeemed or burnt, either through an external acquisition or an intra Entity M&A, corresponding locked TRIE Coins will be unlocked back to the Entity Coin holders.

Future

The future of building a Decentralized Intelligence marketplace lies in creating an open, scalable and privacy-centric ecosystem that democratizes access to AI while fostering global collaboration. By leveraging blockchain for transparency, privacy-preserving technologies for trust and tokenized incentives for participation, TRIE marketplace will redefine how AI solutions are developed, shared and monetized. This evolution will empower individuals and organizations to co-create AI innovations, ensuring that benefits of AI are distributed equitably across industries and communities, paving the way for a fairer digital economy.