




Decentralizing Healthcare

# Unveiling the PharmaTrace Token



# Abstract

The healthcare and pharmaceutical sectors play pivotal roles in global economies, making substantial contributions to GDP and leading essential research initiatives. Despite their significance, supply chain management in these industries often lags in technological advancements, leaving vulnerabilities such as drug adulteration and counterfeiting unchecked. In 2017, PharmaTrace emerged with a clear mission: to revolutionize healthcare supply chains, prioritizing safety and efficiency for all stakeholders, including industry players and patients.



At the heart of our mission lies the collaborative healthcare ecosystem. Designed to address a spectrum of industry-specific challenges — from serialization and track and trace to regulatory compliance — the platform leverages cutting-edge technologies such as Blockchain and AI/ML to optimize operations and mitigate risks.

Having validated our approach, PharmaTrace has garnered pivotal support from the Maltese government and forged strategic partnerships with industry leaders like **Roche, Stada, Hovione, and Evonik, among others** in our initial strides.

Now, with the introduction of the PharmaTrace Token, we stand poised to inaugurate a new era of transparency, collaboration, and trust within our ecosystem and the broader healthcare industry. This token represents a pivotal step towards advancing the success of the ecosystem participants, as well as the well-being of patients and stakeholders alike, solidifying our commitment to innovation and progress.



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# Pharma Supply Challenges

Despite its crucial significance, the current infrastructure for monitoring supply chains in the pharmaceutical and healthcare industries has fallen behind in adopting technological advancements. This has led to increased scrutiny of various issues that adversely affect both patient well-being and the reputation of businesses. Key challenges and concerns include:



## Provenance

Ensuring the authenticity and provenance of pharmaceutical products throughout their lifecycle is essential for mitigating risks related to counterfeit drugs, contamination, and tampering. The World Health Organization (WHO) estimates that counterfeit pharmaceuticals are responsible for approximately 1 million deaths annually. Shockingly, around 10% of all drugs sold globally are fake. The economic impact of this nefarious practice is staggering, with estimated losses ranging between US\$200 and US\$432 billion. The lack of robust provenance tracking mechanisms hampers efforts to trace the origin and history of products, leaving supply chains vulnerable to manipulation and fraud.



## Lack of Visibility

Lack of easily integrated and scalable systems and real-time data collection challenges impede timely responses to critical supply chain events, including the detection of falsified medications, temperature excursions, product shortages, and shipment delays. The annual cost of these inefficiencies exceeds \$600 billion for companies.



## Accountability

Without clear mechanisms for holding stakeholders accountable, identifying the source of supply chain disruptions or discrepancies becomes challenging. The absence of corresponding measures exacerbates risks associated with non-compliance, counterfeit products, and data breaches, hampering efforts to maintain integrity and reliability.



## Compromised Data Security

Serialization compliance mandates rigorous security measures for the generation, storage, exchange, and reporting of serial numbers. With cybersecurity threats on the rise, adopting a zero-trust approach to data protection is imperative for safeguarding sensitive information.



## High Operation Costs

Outdated trace and track systems, devoid of technological innovation, contribute to inflated operational expenses. These antiquated systems not only drain financial resources but also inhibit the implementation of more efficient processes.



## Lack of Incentives

Incentivizing active participation and adherence to best practices within the supply chain is crucial for driving continuous improvement and innovation. The absence of adequate measures discourages stakeholders from investing in technologies and processes that enhance efficiency, security, and compliance.

# Optimizing Supply Chains: Blockchain as the Ideal Solution

Among all the solutions, Blockchain technology emerges as a highly promising one for addressing the above-mentioned multifaceted challenges plaguing the pharmaceutical supply chain.

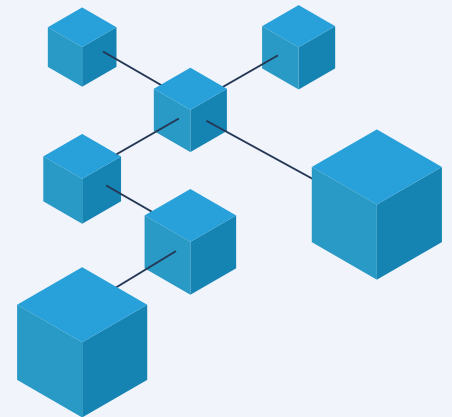
Its decentralized ledger ensures transparency by recording transactions across multiple nodes in a tamper-proof manner. Each transaction is time-stamped and linked to previous ones, enabling stakeholders to trace the entire journey of a product from its origin to its destination in real-time.

Once recorded, data on the blockchain cannot be altered or deleted, ensuring the integrity and permanence of transaction records. This feature is particularly valuable in maintaining the provenance of pharmaceutical products and reporting to governments, as it provides an immutable audit trail of their entire lifecycle.

Blockchain employs cryptographic techniques to secure data and transactions, offering robust protection against unauthorized access and cyber threats. By decentralizing data storage and utilizing consensus mechanisms, it also minimizes the risk of single points of failure and unauthorized manipulation.

Blockchain supports the implementation of smart contracts, self-executing contracts with predefined rules and conditions. And as so it makes it possible to automate various processes within the supply chain such as payment settlements, compliance checks, and contract enforcement.

Finally, Blockchain can be used to design an unbiased incentive mechanism that rewards participation and helps attain a sense of ownership in personal data management.



Applying blockchain technology in supply chains has demonstrated effectiveness across various sectors, including food, luxury goods, and sustainability tracking. For instance, Walmart has successfully utilized blockchain to oversee its suppliers of leafy greens since 2018. Similarly, Nestlé implemented innovative packaging with antennas on milk products to deter tampering, particularly in response to challenges faced in the Chinese market. Additionally, Unilever initiated a pilot project in Indonesia to trace the palm oil they procure, aligning with their commitment to achieving a deforestation-free supply chain by 2023.

Despite these successes in other industries, integrating blockchain into pharmaceutical supply chains has encountered significant challenges. Numerous teams and projects have strived to implement blockchain solutions to enhance security, transparency, and incentives within the pharma sector.

For example, during the pandemic, SkyCell utilized blockchain to develop smart refrigerated containers equipped with IoT sensors for transporting medicines, yet widespread adoption remained limited. However, scaling these solutions has proven difficult due to technical complexities and incentive constraints.

Several years ago, a team of industry and technological experts at PharmaTrace undertook the initiative to tackle these challenges, initiating the development of the PharmaTrace platform. On the one hand, we wanted to use all the benefits Blockchain can provide to solve the burning pharma supply chain issues, but on the other hand, we had to adapt this emerging technology to make it fully compliant with strict pharmaceutical regulations, 100% secure for the treatment of sensitive information, scalable to make it possible to modify in future, and not too expensive.

# Introducing PharmaTrace: The Revolutionary Pharma Ecosystem

PharmaTrace has been introduced with a bold vision: to establish an easily accessible and highly secure healthcare marketplace. Our approach involves harnessing the power of blockchain technology and artificial intelligence (AI) to revolutionize the management of healthcare data across various use cases.

Through our platform, we aim to achieve several key objectives:

- ▶ Enhance transparency to reduce drug counterfeiting, and increase visibility
- ▶ Improve inventory management by making the supply chain fully traceable thereby ensuring medicine availability through trusted information exchange and predictive analytics
- ▶ Boost security and accountability of all stakeholders involved in the supply chain

We prioritize the security and accountability of all participants within the supply chain. Through blockchain integration, we establish a decentralized ecosystem that enables secure interactions among regulatory bodies, healthcare providers, and industry players. This approach mitigates risks, safeguards sensitive data, and enhances overall transparency and accountability.

One of the unique aspects of PharmaTrace is our development of a blockchain-as-a-service model. This innovative approach eliminates the need to get all or any stakeholders on board.

Moreover, our transition from a private permissioned ledger

to a public permissioned blockchain further strengthens our solution's scalability and accessibility while reducing operational costs.

Users, developers, and end users have full control over the customization of data accessibility and sharing features on the platform. Sensitive data will never be disclosed publicly, as the platform incorporates privacy and permissioned protections that can be tailored to meet individual preferences and requirements.

Additionally, we're implementing an incentive model to incentivize honest participation from all stakeholders, fostering collaboration and driving collective success.

In summary, our platform is supported by a wide range of KPIs, like performance, usability, efficiency, engagement, and cost optimization, with a focus on private versus public blockchain trade-offs.

# How the PharmaTrace platform works

The PharmaTrace platform is a versatile Platform-as-a-Service (PaaS) solution designed to address a myriad of use cases, a few of which are outlined below



## Track & Trace System

The PharmaTrace Track & Trace system serves as a robust solution to fortify supply chains, fostering collaboration among endorsers, committers, and critical stakeholders, including government bodies, healthcare providers, and industry players. This decentralized ecosystem, powered by blockchain technology, ensures unparalleled data integrity and transparency throughout the manufacturing and distribution processes. The system facilitates seamless product verification, and track & trace, providing stakeholders with real-time access to authenticated information, further enhancing trust and reliability across the supply chain. Moreover, it enables swift and secure recall actions, bolstering safety and efficiency in the event of product quality concerns.



## Predictive Analytics Tool

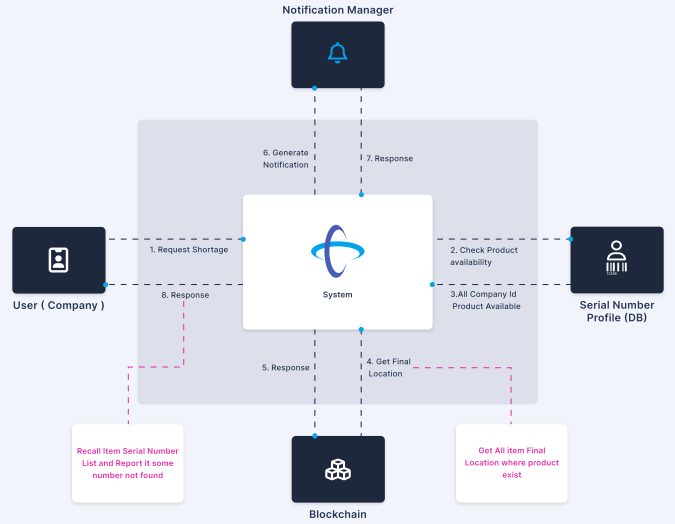
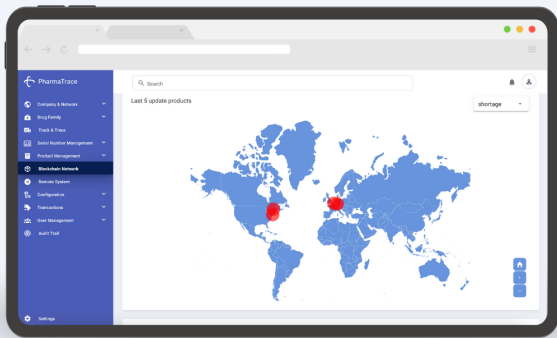
Our advanced Predictive Analytics tool revolutionizes inventory management for drug and vaccine distribution prediction. By harnessing historical data and forecasting future demand trends, it optimizes product amounts, enhancing efficiency and reducing waste. This powerful tool not only provides valuable insights into inventory optimization but also supports decision-making for future scenarios. Furthermore, it plays a pivotal role in predicting chronic disease patterns, enabling proactive interventions and resource allocation. PharmaTrace participants will be able to experience the transformative capabilities of our predictive analytics tool and stay ahead of the curve in healthcare management as well as industry trends in general.



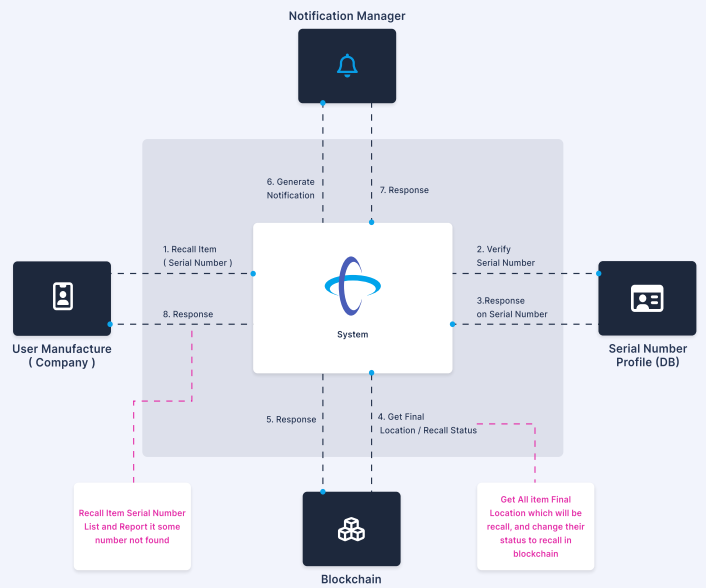
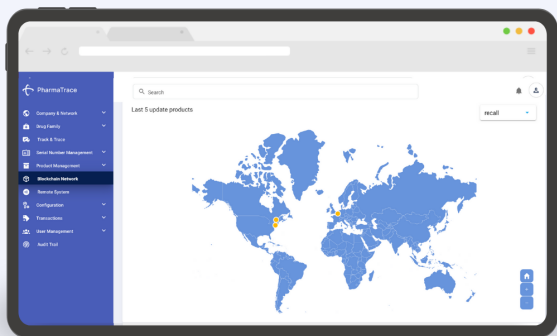
## Inventory Management

The platform employs Vendor Managed Inventory (VMI) principles to optimize inventory management. VMI entails proactive communication between manufacturers and vendors to anticipate shortages and adjust production accordingly. By simulating supply shocks based on past epidemic data, the system enhances control over storage and facilitates informed decision-making. To effectively implement VMI for storage control, access to current inventory and sales information is crucial. While the first is readily available, predicting sales requires innovative approaches. One of them is leveraging encrypted raw stock data provided by the participants through smart contracts. This approach ensures data confidentiality and enables timely order execution when a supply is needed.

# Shortages



# Recalls



# Prospects

## ■ B2B pharma-dedicated E-commerce platform

PharmaTrace E-commerce platform represents a transformative step forward in the pharmaceutical industry's digital evolution. Designed specifically for business-to-business transactions within the pharma sector, it promises to revolutionize procurement processes, streamline supply chain operations, and enhance collaboration among industry stakeholders. By leveraging cutting-edge technologies like blockchain and AI, PharmaTrace sets new standards for reliability, security, and innovation in B2B pharmaceutical E-commerce. We offer advanced features tailored to meet the unique needs of the industry players, such as secure product authentication, regulatory compliance checks, and real-time inventory management, that will empower businesses to source, sell, and distribute pharmaceutical products with unparalleled efficiency and transparency.

## ■ Chronic Disease Pattern Prediction

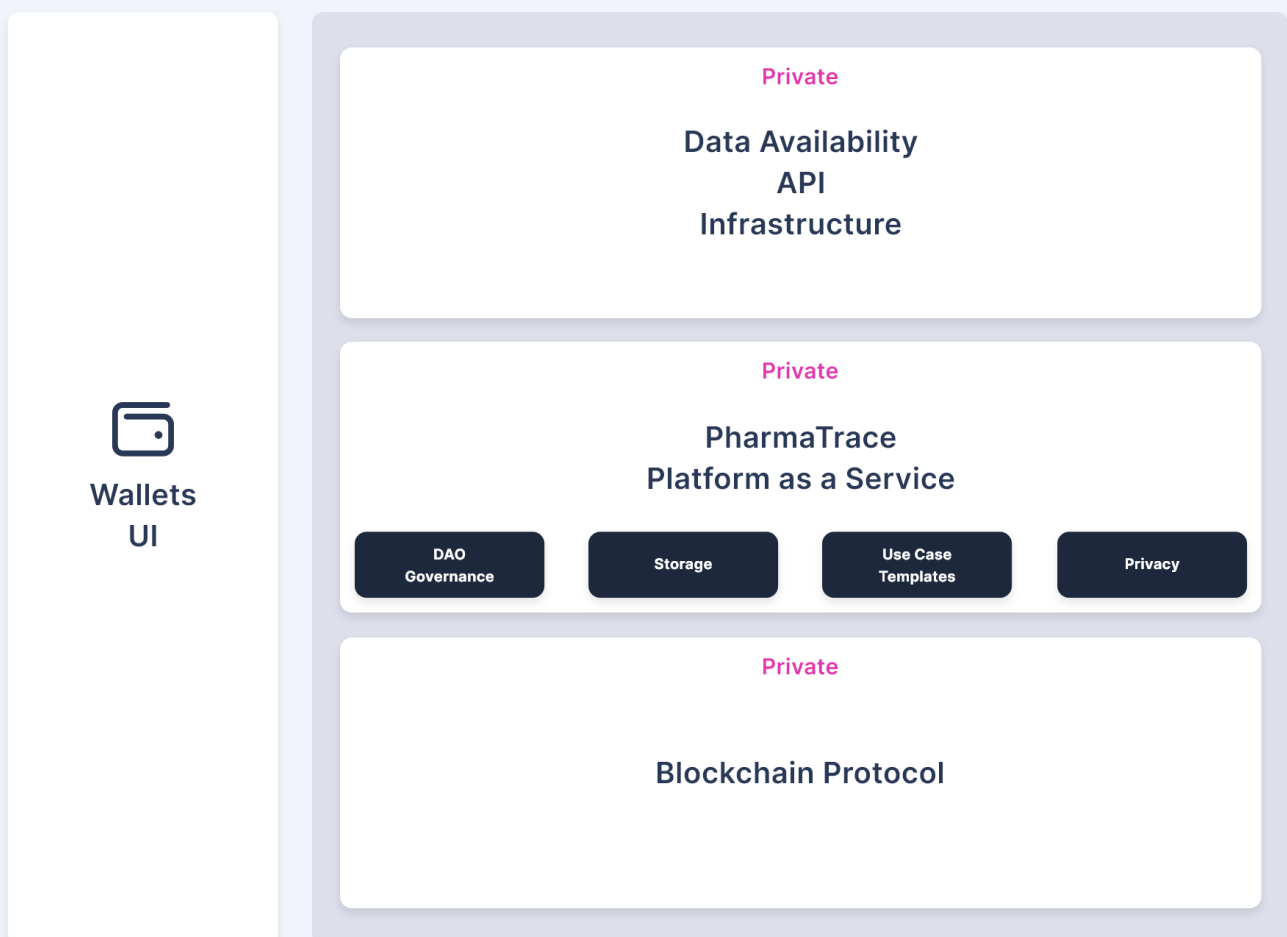
Leveraging data from sources such as the World Health Organization (WHO) API, the platform will analyze health-related information to predict chronic disease patterns. Insights gleaned from this analysis will inform production planning and healthcare interventions, enabling proactive measures to address future health challenges. Additionally, the platform will facilitate targeted communication with healthcare providers and patients to mitigate risks associated with specific diseases, enhancing overall healthcare outcomes.



# Platform tech stack: Past, present and future

## Current State

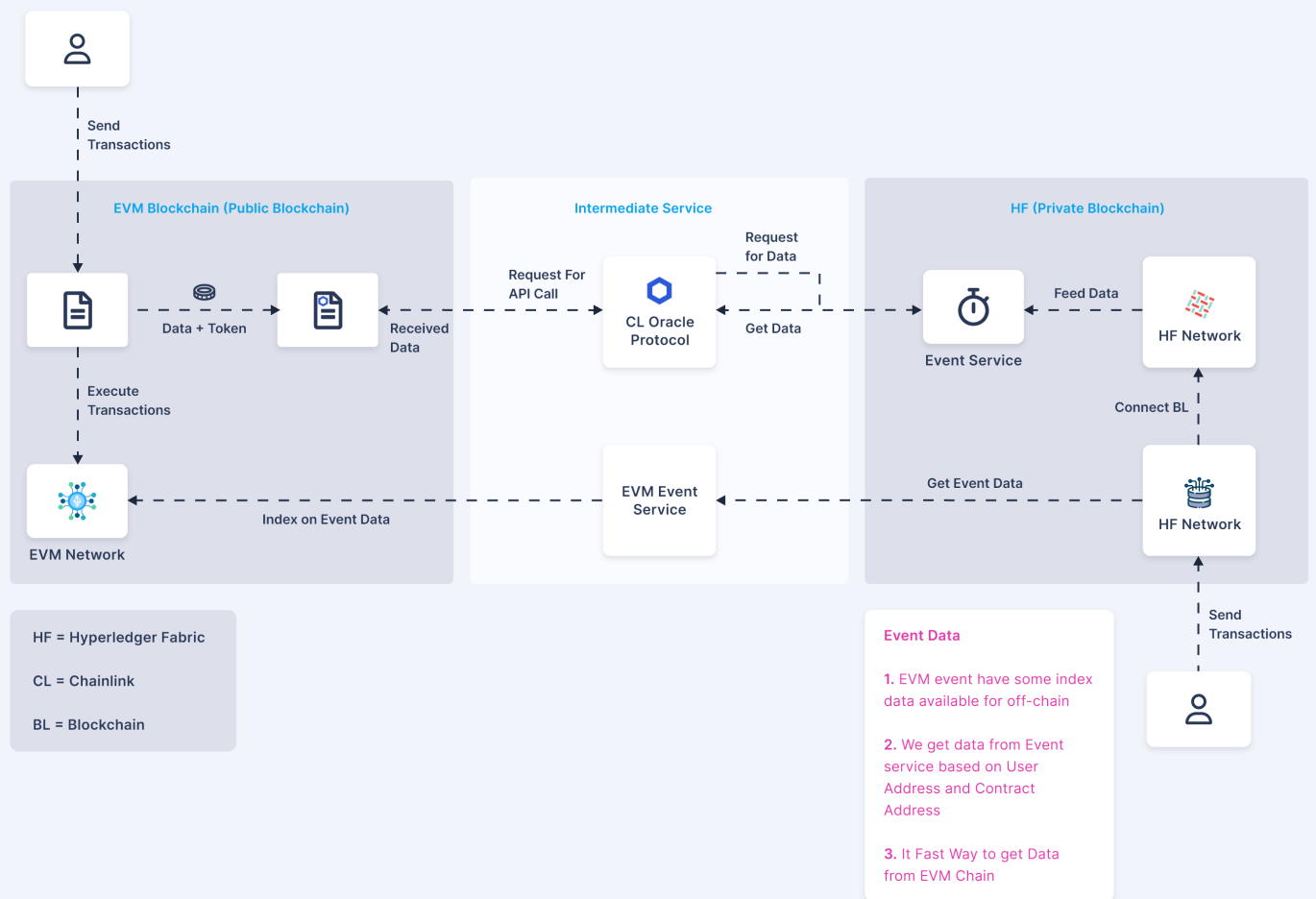
The PharmaTrace platform, built on a private permissioned ledger to facilitate tracking and tracing of pharmaceutical products, is currently operational and accessible for demos and personalized configurations.



*Private Blockchain-enabled platform*

## Current focus

Our current focus involves integrating public blockchain into the platform through bridges. This strategic move is aimed at enhancing security and privacy while introducing an incentive mechanism for various stakeholders within the ecosystem.



Private and Public blockchain-enabled platform

Our system is engineered to facilitate seamless data sharing between both permissioned and permissionless blockchain segments, necessitating an intermediary solution to ensure smooth and problem-free transactions. This intermediary, known as a blockchain bridge, will play a critical role in our architecture to provide:

### ■ Data Sharing

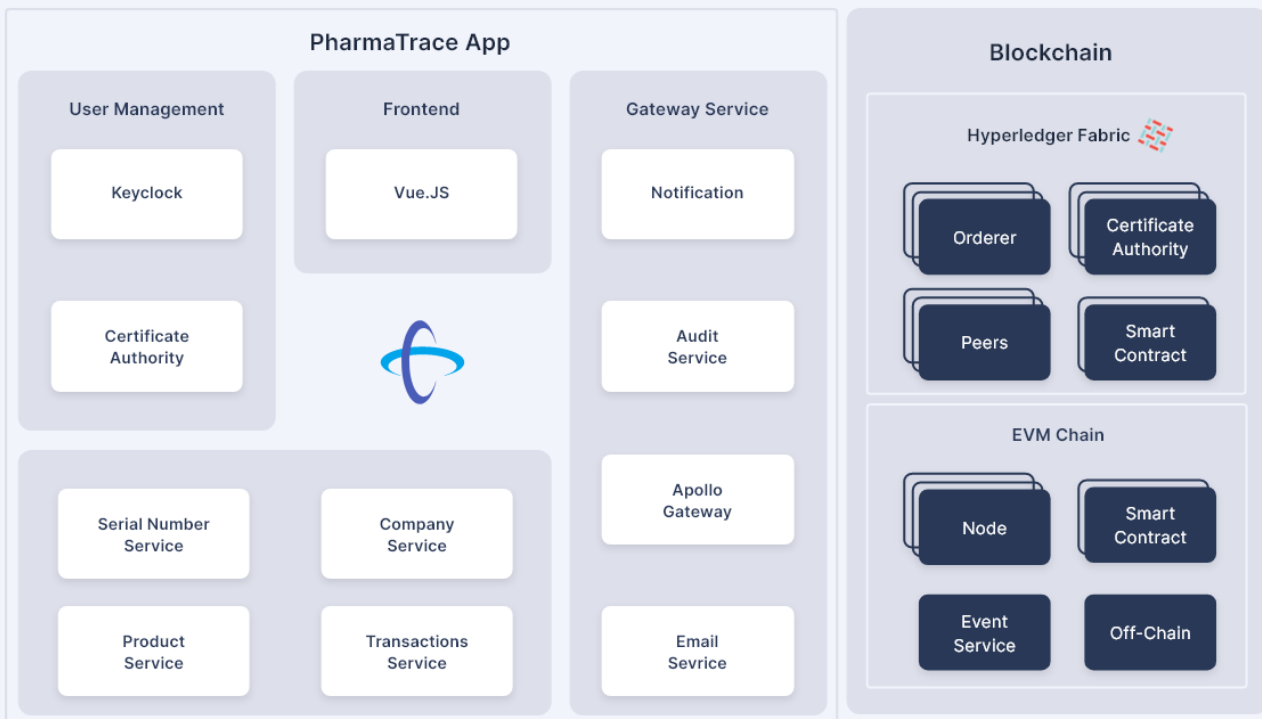
It allows for the exchange of data, assets, or other information between the two blockchain platforms, ensuring that transactions and interactions are executed smoothly across the different blockchain environments.

### ■ Seamless Transactions

The bridge facilitates a seamless flow of transactions, enhancing the interoperability between the permissioned and permissionless blockchains. This is essential for maintaining operational efficiency and user experience.

### ■ Security and Privacy

While enabling data transfer, the bridge also upholds the security protocols and privacy requirements of both blockchain systems, ensuring that data integrity and confidentiality are not compromised.



## Long-term goal

Our overarching objective is to migrate towards a public permissioned ledger ecosystem governed by decentralized governance. This transition aims to open up our platform to external developers, allowing them to leverage the foundation of the PharmaTrace platform while also providing incentives for further development and innovation.

## Product Roadmap

### Public blockchain integration to scale the platform

With a strong belief in an interoperable and modular ecosystem, we aim to achieve integration across multiple blockchains. Our team is diligently working towards integrating our platform as an application and, in the long run, as a layer 2 solution on public blockchains, prioritizing data security and privacy management within the next 18 to 24 months. Our goal is to launch the PharmaTrace platform on at least one blockchain in 2024, with plans for further expansion to additional blockchains.

We will initiate token issuance on Polygon and allocate the same to our initial investors via SAFT. Additionally, we will continue to scale and integrate different blockchains according to use case requirements, making the tokens available across multiple chains.

Moving forward, we envision incorporating interoperability, modularity, and privacy into the system as it evolves, ultimately aiming to transition our platform into an open-source solution governed by token holders.

# Product Roadmap



# Business Roadmap

## Ecosystem building, grants, and tokens

Our roadmap involves ecosystem building, grants, and token utilization as we transition towards a decentralized platform. We are exploring various avenues for revenue generation, including:

### ■ B2B Enterprise

We aim to leverage business-to-business opportunities to generate revenue within our ecosystem.

### ■ Transactions on the Platform

Revenue will be generated through transactions conducted on the platform, serving as a key source of income.

### ■ Grants for Public Blockchain Integration

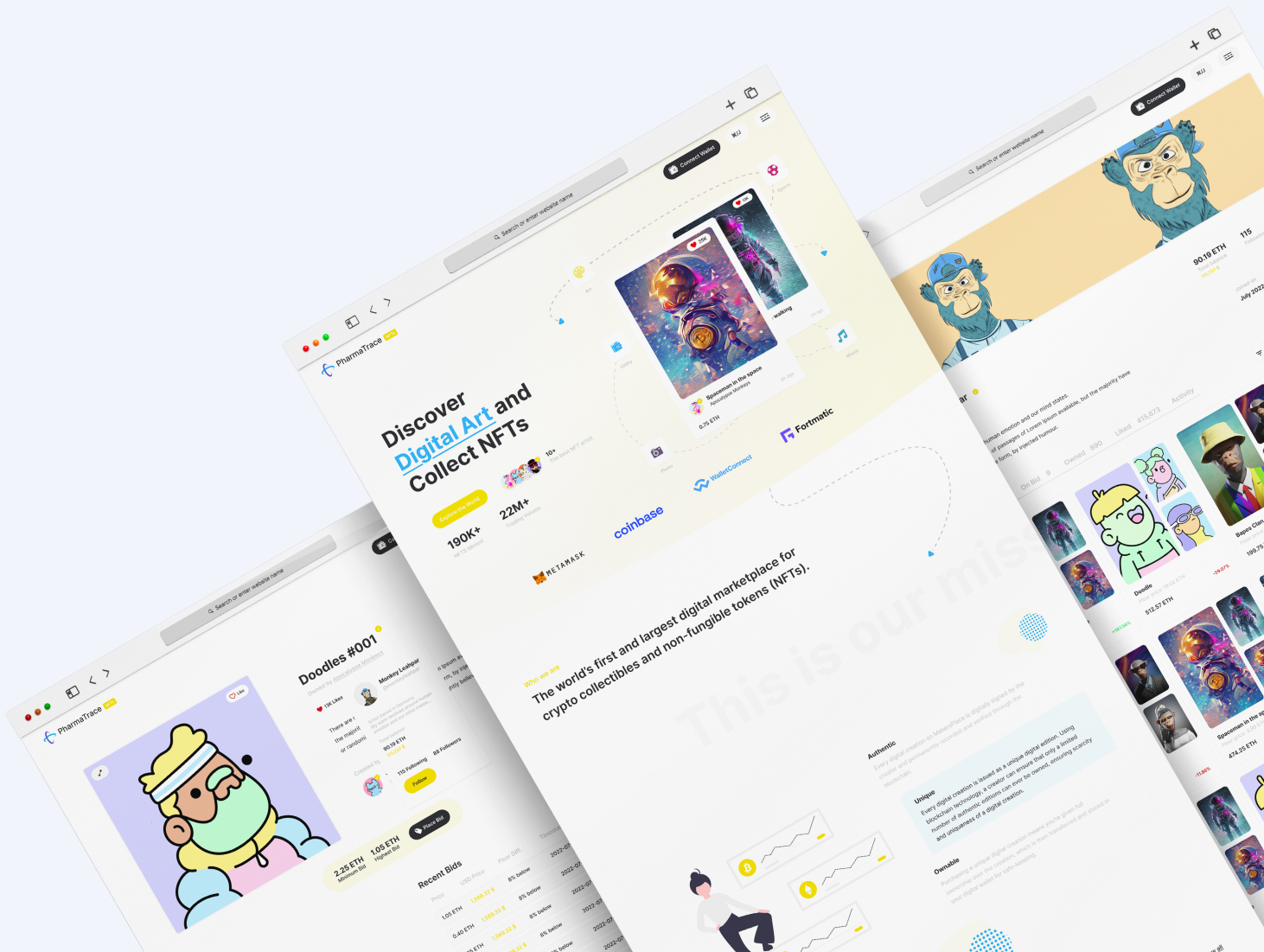
We are actively seeking grants to support the integration of public blockchain, further enhancing our platform's capabilities.

In the long term, we envision a payment system where a combination of PT tokens and stablecoins will be utilized for all transactions on the platform, providing flexibility and stability in payment processing.

# NFT Platform: An Additional Benefit for Ecosystem Participants

In addition to our comprehensive supply chain platform, we offer a ready-to-use NFT marketplace, fostering collaboration among medical organizations, individual researchers, collectors, patients, and investors. The platform is fully customizable and can be tailored for various applications including **medical and clinical trial records, medicine brand verification, medical record monetization, identity management and access protection**, etc. Interested organizations can be provided with dedicated spaces for their specific needs and use cases.

However, the primary purpose of the NFT platform within PharmaTrace’s ecosystem is to enable participants to **sell digital art and other collectibles for charities and various project crowdfunding initiatives**. Artists, charity organizations, hospitals, and other institutions aiming to fundraise for healthcare-related matters can benefit from secure funding backed by blockchain technology.



# Main Benefits

The healthcare NFT platform offers several key benefits that distinguish it in the industry, contributing to a user-centric and financially sustainable ecosystem:

01.

**Lazy minting** allows creators to mint NFTs only upon purchase, reducing upfront costs and streamlining the process.

02.

**Lower platform fees** ensure creators retain a larger portion of their earnings, fostering equity within the ecosystem.

03.

The platform ensures **reliable proof of identity** through a '**one-user, one-identity**' approach, enhancing trust and security within the community.

04.

**Creators are not required to pay any fees until their NFTs are purchased**, minimizing financial risk and maximizing potential returns.

05.

The platform operates on an **App-As-A-Service basis**, with exclusive and branded mobile and web apps available upon request.

06.

Fast deployment takes **up to 90 days**.

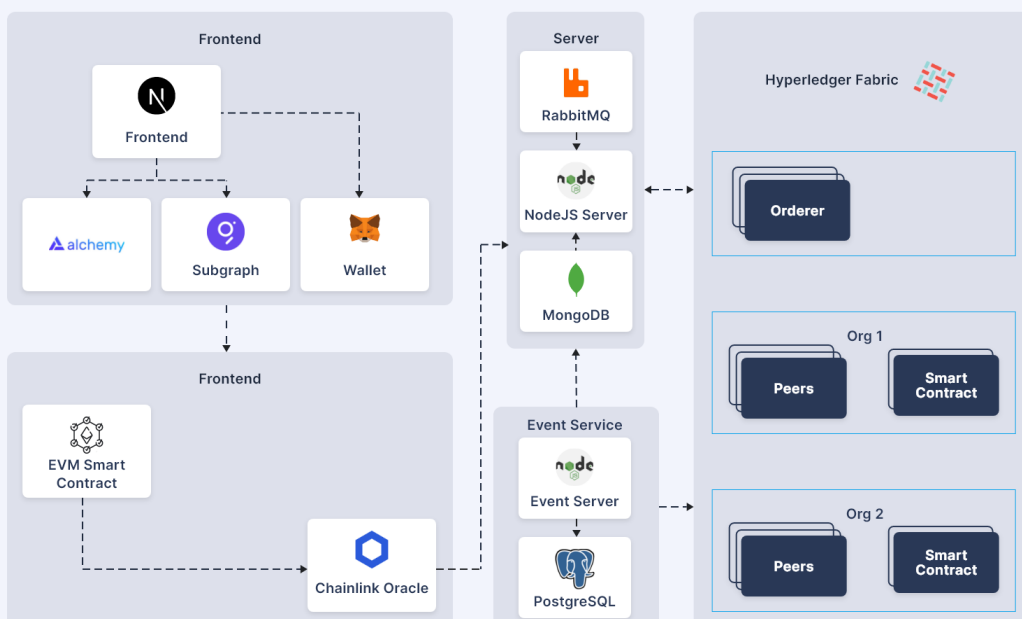
# How It Works

The NFT Marketplace enables users to **sell their existing NFTs and add them to other collections**, with service fees charged at the time of sale. Charity organizers can **host charity events and manage transactions** on the platform, with revenues automatically transferred to their accounts after platform fees are deducted. Creators **can mint lazy NFTs or list existing ones for auction**, with fees charged upon purchase by buyers.

## Mixed Blockchain and Other Technologies

Our unique solution combines **public and private blockchains** to effectively manage tokens, sensitive data, and transactions, reducing costs for users and ensuring data security. NFT creation, sales, and auctions occur on the Public Blockchain using tokens, while charities and lazy minting are managed with Private Blockchain smart contracts to record all events.

Leveraging cutting-edge technologies such as **cloud computing EKS for Docker Container Orchestration, Alchemy, GraphQL, SubGraph, Hyperledger Fabric, React-Native, NextJS, Node/Express, PostgreSQL, smart contracts, IPFS, and token standards like ERC 721, ERC 1155, and ERC 20**, our platform is poised to revolutionize healthcare management in a decentralized ecosystem.



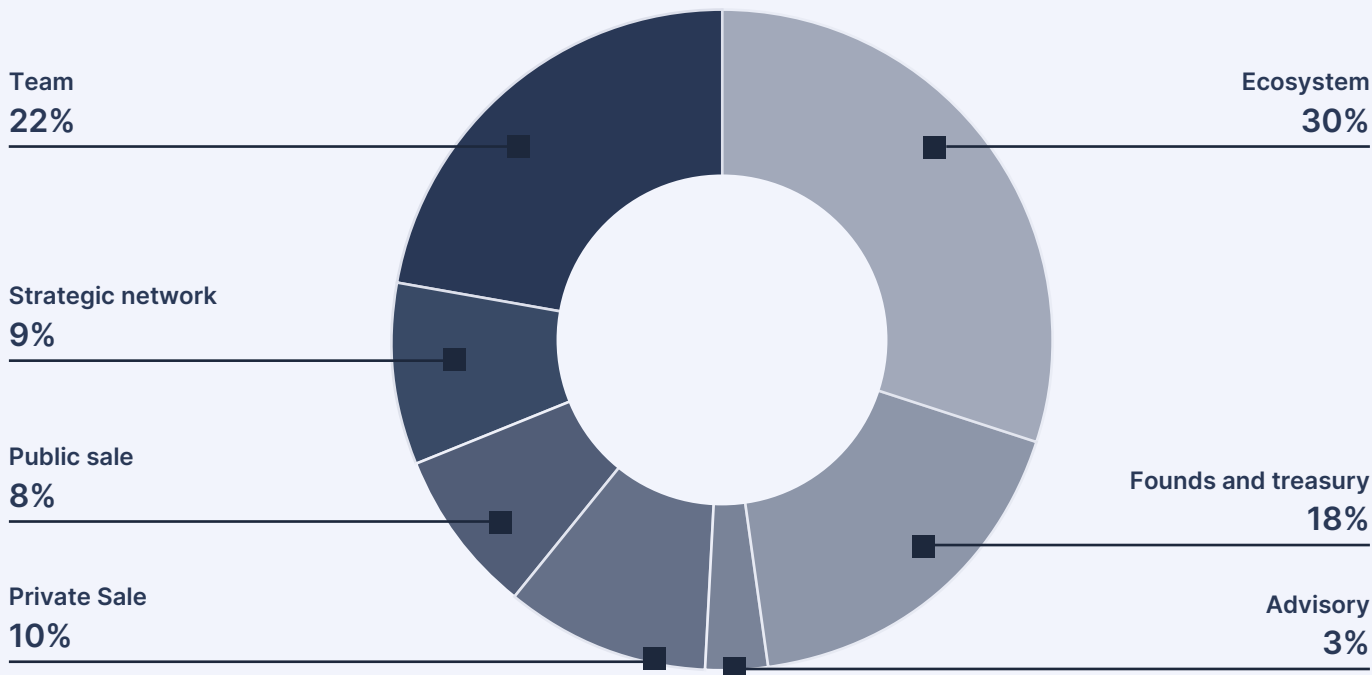
# PharmaTrace Token

A crucial platform aspect was to encourage user and stakeholder engagement while ensuring security and an open governance model. This prompted the creation of the PharmaTrace token. Therefore, we're thrilled to announce the introduction of the PT token, which will be issued on the Polygon network.

## Tokenomics

The total token supply will be 1 billion, with an initial token circulation of no more than 15% at the Token Generation Event (TGE). To control the maximum supply, measures such as inflation, staking incentives, and long-term vision will be implemented. The allocation of tokens for various initiatives is illustrated below.

## PT Tokenomics



With a focus on scaling, security, incentives, and community engagement, the factors driving the development of our tokenomics encompass:

- Utilization within healthcare and pharmaceutical industry scenarios
- Incentivization for stakeholders and end users
- Potential cost efficiencies and platform functionality

## Token Distribution Strategy

With 48% of the tokens designated for ecosystem expansion and supporting projects within the PharmaTrace ecosystem, we anticipate significant scaling and coverage across multiple use cases. Allocation of 25% of tokens to the core team, advisors, and future contributors reflects our commitment to project development. Additionally, 9% of tokens are reserved for strategic partnerships to facilitate scalability objectives. A total of 18% of tokens are allocated for private and public sales, aimed at garnering support from long-term backers and community members to uphold network integrity, transparency, and openness.

Each allocation will adhere to a predefined vesting and release schedule established by industry standards.

## Token Utility

PT tokens are platform native tokens to be used as an incentive to not only cover the transaction costs but also to keep the stakeholders contributing honestly. The major functionalities of the PT token will be as follows:

### ■ Platform Governance

We will gradually move towards a decentralized form of governance with a DAO and foundation steering the future developments details of which will be shared in due course of time.

### ■ Network Security

We will gradually move towards a decentralized form of governance with a DAO and foundation steering the future developments details of which will be shared in due course of time.

### ■ Foundation Treasury

The funds allocated in the treasury will be used for ecosystem development as well as for funding future use case development such as record management for clinical trials, serialization, EHR management, NFTs, etc. in the healthcare and pharma industry.

### ■ Ecosystem Incubation & Acceleration

Such as B2B market data, analytics, and insights generation.

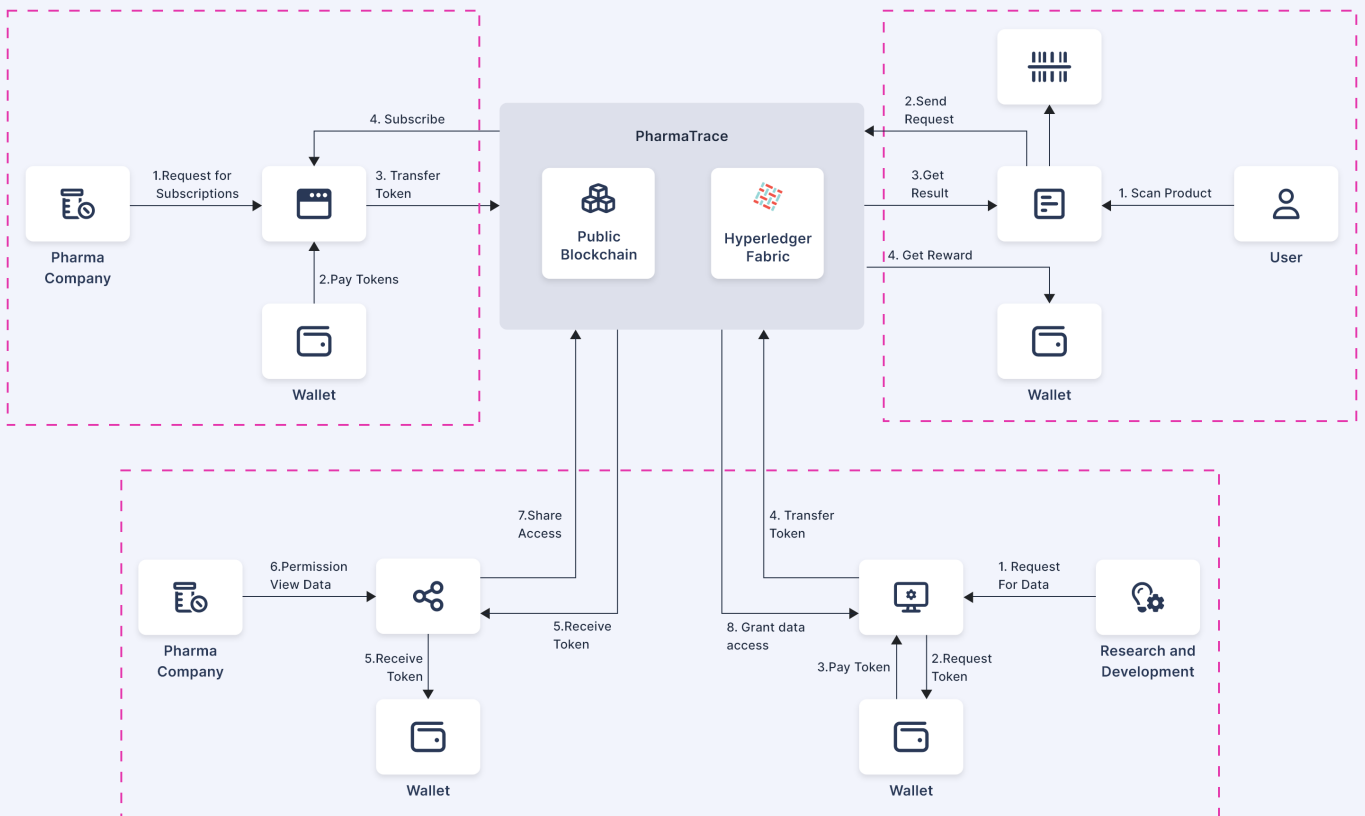
### ■ NFT rewards

e.g. clinical trials participation, recruitments, efforts rewards, events.

PT tokens will be used in conjunction with stablecoins in the settlement layer to pay for the majority of services available on the platform. However, additional discounting will be made available to use the platform tokens.

## Token Flow

Below we depict the interim token flow of PT tokens, for one use case, and how different stakeholders use it in the ecosystem.



**User or Patient**

Earn Tokens as Rewards for Validating Products

**Manufacturing Companies**

Utilize Tokens for Accessing Services on the PharmaTrace Platform.

**Third Parties**

Access Customer Data on the Platform for Medical or Market Research, Utilizing Tokens as Payment.

# Risks Covered

The experienced team at PharmaTrace is fully aware of the risks associated with developing a comprehensive platform for blockchain integration with minimal complications. Some of these risks include:

## ■ Balancing Data Privacy with Transparenc

Addressing concerns regarding the trade-off between transparency and protecting business secrets, while ensuring user-friendly usability.

## ■ Ensuring Data Integrity and Reliability

Maintaining the integrity and reliability of gathered data and the credibility of data providers.

## ■ Compliance with Healthcare Regulations

Adhering to healthcare regulations and legal constraints specific to each country where the PharmaTrace Track & Trace Ecosystem is implemented.

## ■ Project Delivery Delays

Potential delays in project delivery due to additional requirements, technological limitations, and other unforeseen factors.

## ■ Data Entry Challenges

Overcoming challenges related to the process of entering data at its source.

## ■ Incentivizing Data Entry and Platform Use

Addressing the lack of incentives for data entry and platform usage, which may include monetary rewards or tax credits.

## ■ Encouraging Platform Adoption

Encouraging businesses and governments to participate and accept decentralized interaction facilitated by the platform.

## Final Words

Tokenization presents a transformative opportunity for the pharmaceutical and healthcare industries, offering a decentralized framework that enhances transparency, security, and efficiency across various operations.

PharmaTrace token offers a means of streamlining transactions, incentivizing behaviors, and fostering collaboration across the ecosystem. Furthermore, it enables a new business model, decentralized healthcare platform, and patient-centered approaches, ultimately empowering platform participants and other stakeholders, and improving overall healthcare outcomes.

As the industries continue to embrace digital transformation, tokenization stands poised to reshape the landscape, driving innovation, and delivering tangible benefits to patients, providers, and stakeholders alike.

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