



**SUKU** TRUTH. VERIFIED.

2020

# Whitepaper

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## SUKU Vision

***SUKU™ is a blockchain-based ecosystem that aims to make supply chains more transparent, efficient, and accessible by offering a supply-chain-as-a-service platform that connects businesses and consumers.***

Supply chains run the world, but they are becoming increasingly complex, functionally limited, solied, and in need of innovation. Logistics costs are deterring businesses, companies are faced with fragmented supply chains, and millions of fraudulent products continually find their way into global markets. These challenges also lead to more serious consequences affecting the globe, such as food sourcing problems and inhumane working conditions.

We are introducing SUKU, a blockchain-based ecosystem that aims to make supply chains more transparent, efficient, and accessible by offering a supply-chain-as-a-service platform to enterprises and consumers. With its intention to enhance supply chains across industries, the SUKU Platform utilizes an on-demand, open software distribution model, consisting of applications and services that are used by SUKU Trading Partners and built with SUKU Technology Partners.

The purpose of this whitepaper is to cover the following:

1. To highlight the opportunities and challenges in traditional supply chains
2. To articulate the SUKU's vision and its differentiating capabilities
3. To express our views on the power of blockchain and how the SUKU Platform plans to uniquely utilize it

## SUKU Ecosystem

The SUKU Ecosystem is comprised of the following components:

1. **SUKU Platform:** Capabilities, services, and features that allow Trading Partners to transact amongst each other and to utilize applications built by Technology Partners
2. **SUKU Token:** An ERC20-compatible token that is used by Trading Partners and Technology Partners within the SUKU Ecosystem
3. **Trading Partners:** SUKU Platform users who interact and transact on the platform as supply chain participants
4. **Technology Partners:** Organizations or individual developers who create applications or provide services on top of the SUKU Core Layer for users, such as Trading Partners



An incentivization model is being used to drive SUKU Ecosystem adoption by both Trading Partners and Technology Partners. Furthermore, we plan to have three reserves to incentivize the technology and business community to participate within the SUKU Ecosystem.

## SUKU Architecture

The initial release of the SUKU Platform leverages a dual-node architecture composed of public Ethereum and permissioned Quorum. The SUKU Architecture is comprised of the following four layers:

- 1. Applications and Services Layer:** Allows for applications and services to be built on top of the SUKU Core Layer
- 2. Core Layer:** Contains the core capabilities that participants will use on the SUKU Platform
- 3. Blockchain Layer:** Upholds the integrity and security of transactions. SUKU is being built utilizing public Ethereum and permissioned Quorum
- 4. Infrastructure Layer:** Operate nodes and infrastructure to support the aforementioned layers (e.g., Amazon Web Services, Azure, Google Cloud Services, etc.)



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# 1. Supply Chain Opportunity



## 1.1. Current Supply Chain Situation

Today's supply chains are complex and typically employ ineffective software solutions, which oftentimes leads to supply chains that are inaccessible and fragmented among participants. Nearly 80% of all organizations are focused on creating disruption and market competition through new "digital-savvy" initiatives.<sup>1</sup>

A Gartner study also elaborates on such initiatives – 65% of surveyed supply chain professionals stated that technology will be a competitive advantage for their supply chain operations.<sup>2</sup> Yet, relatively small steps have been taken by many enterprises to modernize their complex supply chains. The aging supply chain processes produce vast inefficiencies that continually create poor outcomes for consumers and missed opportunities for organizations across the supply chain, including, but not limited to:

1. **Suppliers:** Only 5% of purchasers claim they are able to consistently pay suppliers on time.<sup>3</sup>
2. **Manufacturers:** Only 35% of manufacturers utilize supply chain management software, (due to lack of access).<sup>4</sup>
3. **Distributors:** The top 5% of distributor accounts typically represent 65–70% of sales.<sup>5</sup>
4. **Retailers:** Only 6% of businesses claim to have achieved full supply chain visibility.<sup>6</sup>
5. **Consumers:** Product transparency and authenticity is a continually growing concern with an estimated \$1.2 Trillion counterfeit good market size.<sup>7</sup>

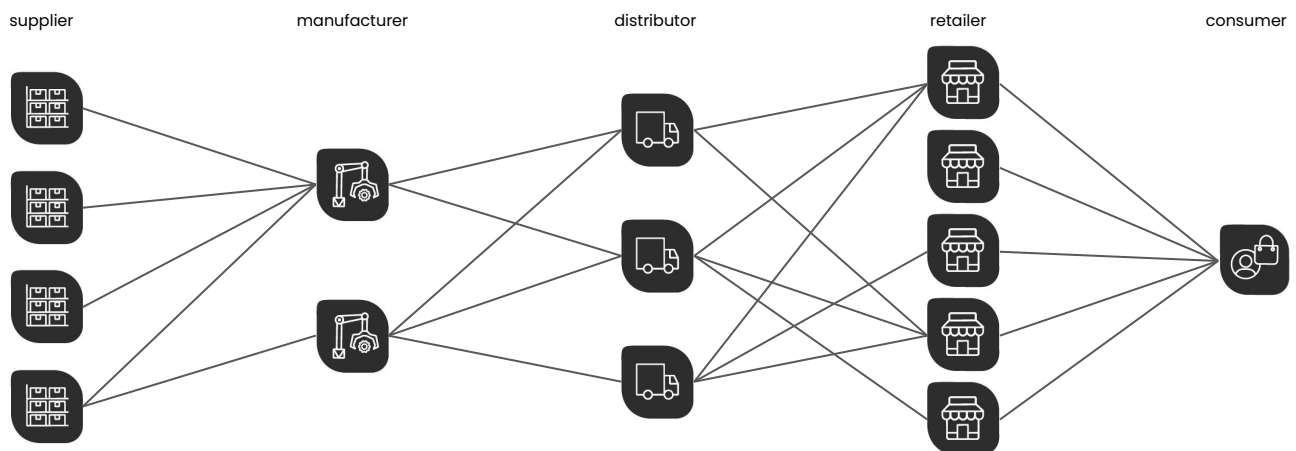


Figure 1: Today's Complex Point-to-Point Supply Chains

<sup>1</sup> Fersht, Phil, et al. "The Future Belongs to Intelligent Operations." Accenture, HFS Research, 2018.

<sup>2</sup> Klappich, C. Dwight, et al. "Gartner Predictions for the Future of Supply Chain Operations in 2018." Gartner, 2017.

<sup>3</sup> Weissman, Rich. "Late Supplier Payments Lead to Low Performance, Higher Costs." Supply Chain Dive, 17 Nov. 2017.

<sup>4</sup> "Supply Chain Management Systems See Gains in Adoption, Investment." Supply Chain Management Systems See Gains in Adoption, Investment | Computer Economics

<sup>5</sup> Cerasis IT. "10 Issues Keeping Manufacturers and Distributors Up." Cerasis, 20 Jan. 2015

<sup>6</sup> Patrick, Kate. "Only 6% of Companies Believe They've Achieved Full Supply Chain Visibility." Supply Chain Dive, 26 Feb. 2018

<sup>7</sup> "Global Brand Counterfeiting Report 2018: Value of Counterfeited Goods in 2017 Amounted to \$1.2 Trillion – Research and Markets." Business Wire, 22 Dec. 2017.



## 1.2. Supply Chain Opportunities

Historically, supply chains have been based on bilateral trading relationships; physical products moving among suppliers, manufacturers, distributors, retailers, and consumers, while leveraging various logistics partners (e.g., carriers, truckers, authorities) for the movement of these goods.

There have been significant innovations to supply chains, such as cloud computing, mobile platforms, and RFID technologies. However, these have led to many organizations ending up with a variety of systems such as ERP (Enterprise Resource Planning), SCMP (Supply Chain Management Platforms) and the use various SaaS (Software-as-a-service) applications and platform services.

The lack of integration across these systems has created fragmented data silos, leading to opportunities across industries, such as:

1. **Transparency:** The opportunity for increased transparency into a product's history and provenance, the quality of its contents, and associated inputs and outputs.
2. **Efficiency:** The opportunity to gain efficiency by bringing together supply chain participants under one collaborative environment.
3. **Access:** The opportunity to access supply chain technology solutions at a low cost, business opportunities, and new counterparties for all sizes of organizations.

### Transparency

As you are walking through grocery stores, you see products labeled as 'premium', 'organic', or 'eco-friendly'. How do you know that these claims are true and that these third parties are reliable? Can you validate and verify, step-by-step, the exact claims of your product? In most cases, businesses and consumers lack the ability to validate these claims due to a lack of transparency into the supply chain of the finished good. Additionally, manufacturers and brands have limited access to their suppliers systems to show the journey of their product.

Typically, the solution to this lack of transparency results in the need for additional infrastructure, ineffective data collection, management oversight, and increased bureaucracy for each of the supply chain participants. Blockchain platforms aim to dramatically reduce these inefficiencies, while decreasing fraud and the need for middlemen. Blockchain solutions provide the ability to create a collective journey map when sharing data across participants. Ultimately this journey map and data aggregation enable supply chain participants to prove claims about their products.



# 1. Supply Chain **Opportunity**



## **Efficiency**

Business partners want seamless integration across platforms and processes, including the use of established data and process standards. In general, platforms are often well positioned to facilitate the interfacing of systems, via APIs for example, and the compliance to industry standards. Additionally, blockchain-based platforms can provide additional benefits, such as the automation of contract execution (e.g., smart contracts) or by providing a continual audit trail.

Blockchain-based solutions can provide efficiency and auditability of transactions, which may improve an organization's ability to comply with regulations. With the continual audit trail that blockchains provide, real-time compliance checks and settlement become possible, potentially reducing the time and cost associated with traditional processes. These can result in increased efficiency for individual organizations or across an industry.

## **Access**

The lack of access to innovative technology, such as IoT, advanced analytics, and blockchain, is limiting for organizations to improve their operations. Many organizations today struggle with the integration of these innovations with their existing infrastructure (ERP, CRM, vendor management, etc.). The use of a decentralized blockchain-based platform could democratize access to innovative solutions across the supply chain.

By adopting advanced technologies, small and large organizations may gain more flexibility as they are able to respond to market changes faster and more efficiently. For example, manufacturing and logistics operations should be adjusted automatically when a new product promotion video has gone viral on social media or when a competitor releases a competing product.

As economies around the world become more mature, supply chain participants have opportunities to expand their operations in these markets. Decentralized platforms can serve as an accelerator for increased access to these markets by providing new business opportunities.

# 1. Supply Chain **Opportunity**



## 1.3. Opportunity Through Blockchain Technology

Blockchain, a shared and immutable ledger, is a disruptive innovation with immediate applicability for use cases within supply chain. Blockchain creates a trusted layer of connection, communication, and engagement among participants, leading to a more collaborative way of doing business across the supply chain. With respect to blockchain technology, supply chain executives should focus efforts on establishing or joining an ecosystem of trusted trading partners, including contributing knowledge and expertise on what information should be shared and regulated.<sup>8</sup>



Figure 2: Traditional Supply Chain

Traditional supply chains (Figure 2) are depicted as a linear structure, often failing to connect the supplier, manufacturer, distributor, retailer, and end consumer efficiently. This linear structure has historically resulted in fragmented transactional data across participants, often leading to incomplete or conflicting copies of data; with the use of blockchain, we can reshape these linear and siloed supply chains into dynamic interconnected networks (Figure 3).



Figure 3: Modernized Supply Chain on SUKU Ecosystem

<sup>8</sup>Pradhan, A, & Stevens, A, & Johnson, J. (2017, November 1). Supply Chains Are Racing to Understand Blockchain — What Chief Supply Chain Officers Need to Know (ID: G00340466). Retrieved from Gartner database.

# 1. Supply Chain **Opportunity**



Larger organizations with complex supply chains can utilize the SUKU Platform to complement their existing infrastructure, aiming to increase transparency. Smaller organizations with little or no existing infrastructure aim to improve accessibility through the suite of SUKU Platform capabilities. Both of these opportunities aim to increase the efficiency of supply chains, regardless of industry or size. The approach SUKU takes for each opportunity is detailed below (Figure 4).

	<b>transparency</b>	<b>efficiency</b>	<b>accessibility</b>
<b>HIGH LEVEL DEFINITION</b>	Transparency into a product's history, the quality of its contents and associated inputs and outputs by aggregating fragmented data	Efficiency gained by bringing together supply chain participants into a collaborative environment	Access to innovative technology, business opportunities, and new counterparties
<b>SUPPLY CHAIN OPPORTUNITY</b>	<p>Across supply chains, organizations need:</p> <ul style="list-style-type: none"> <li>Ability to view the transparent history of products</li> <li>Ability to verify supplier transactions</li> <li>Ability to link together fragmented data for a holistic view of the product's provenance</li> </ul>	<p>Across supply chains, organizations need:</p> <ul style="list-style-type: none"> <li>Ability to collaborate with counterparties on a single platform</li> <li>Ability to reduce transaction costs and enable faster business transactions</li> </ul>	<p>Across supply chains, organizations need:</p> <ul style="list-style-type: none"> <li>Access to technical solutions for more engagement in the supply chain</li> <li>Access to markets and market data for new business opportunities</li> </ul>
<b>BENEFITS OF SUKU ECOSYSTEM</b>	<ul style="list-style-type: none"> <li>Offers transparency of goods, data, and transactions across the supply chain</li> <li>Leverages blockchain technology to distribute both information and control, to maintain data immutability – this minimizes the need for trust between transacting parties</li> </ul>	<ul style="list-style-type: none"> <li>Offers an open B2B marketplace, that enables faster business transactions</li> <li>Connects Trading Partners based on preferences and needs, aiming to reduce time and cost overhead</li> </ul>	<ul style="list-style-type: none"> <li>Provides the foundational infrastructure to enable access to supply chain applications</li> <li>Allows participants, regardless of their size or state of digital maturity, to participate in the ecosystem at a low cost</li> </ul>

Figure 4: SUKU Ecosystem Applicability to Supply Chain Opportunities



### 2.1. SUKU Vision

Imagine a digital supply chain ecosystem that enables transparency across partners, efficiency individually, and access to technology – we plan on delivering this new model:

***SUKU™ is a blockchain-based ecosystem that aims to make supply chains more transparent, efficient, and accessible by offering a supply-chain-as-a-service platform that connects businesses and consumers.***

The SUKU Ecosystem plans to use an on-demand, open software distribution model, consisting of applications and services that are utilized by SUKU Trading Partners and built with SUKU Technology Partners. The SUKU Ecosystem intends to connect Trading Partners (buyers and sellers) and Technology Partners in a distributed ecosystem, enabling business networks to expand and benefit from supply chain technology, all while providing additional benefits to the end consumer.



## 3.1. Introduction

The SUKU Ecosystem is made up of four primary components, described below:

- 1. SUKU Platform:** Capabilities, services, and features that allow Trading Partners to transact amongst each other and to utilize applications built by Technology Partners
- 2. SUKU Token:** An ERC20-compatible token that is used by Trading Partners and Technology Partners within the SUKU Ecosystem
- 3. Trading Partners:** SUKU Platform users who interact and transact on the platform as supply chain participants
- 4. Technology Partners:** Organizations or individual developers who create applications or provide services on top of the SUKU Core Layer for users, such as Trading Partners

Below (Figure 5) shows a high level depiction of the SUKU Ecosystem.

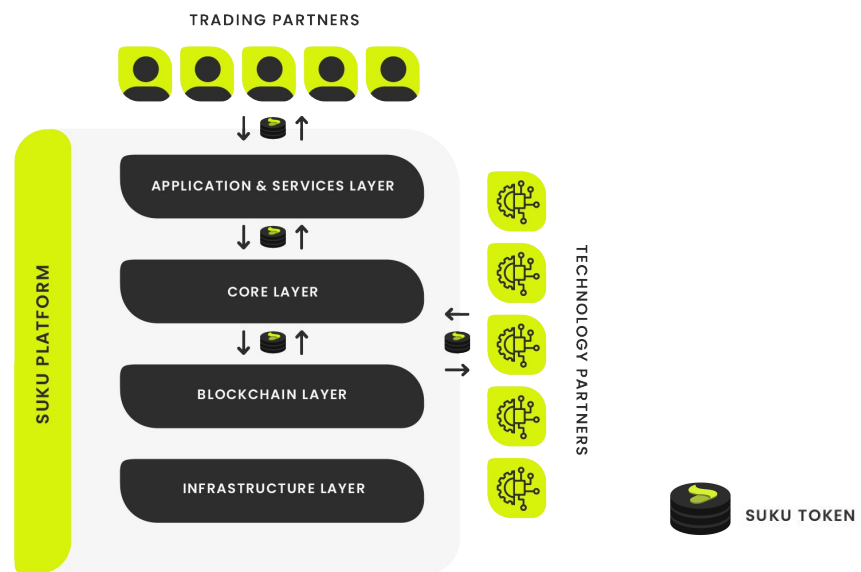


Figure 5: SUKU Ecosystem (High-Level)

## 3.2. Platform

As depicted in above (Figure 5), the SUKU Platform is composed of four layers: Application and Services, SUKU Core, Blockchain Layer, and Infrastructure. These layers are elaborated on in greater detail in Section 4.2. Trading Partners interface directly with functionality inside of the SUKU Core, as well as utilizing Applications and Services that exist on the top layer of the SUKU Platform.

# 3. SUKU Ecosystem



Section 3.2.1 introduces the core SUKU Platform capabilities that reside in the SUKU Core Layer. The Application and Services Layer enables Technology Partners to develop additional applications and services, further detailed in Section 4 SUKU Architecture.

## 3.2.1. Platform Capabilities

The SUKU Core Layer is made up of capabilities and features, which facilitate Trading Partner engagement across the supply chain. The most prominent capabilities include:

1. Track & Trace
2. Marketplace
3. Document Authenticator
4. Ecosystem Onboarding & Configuration

The diagram below (Figure 6) further elaborates on these capabilities and their benefits.

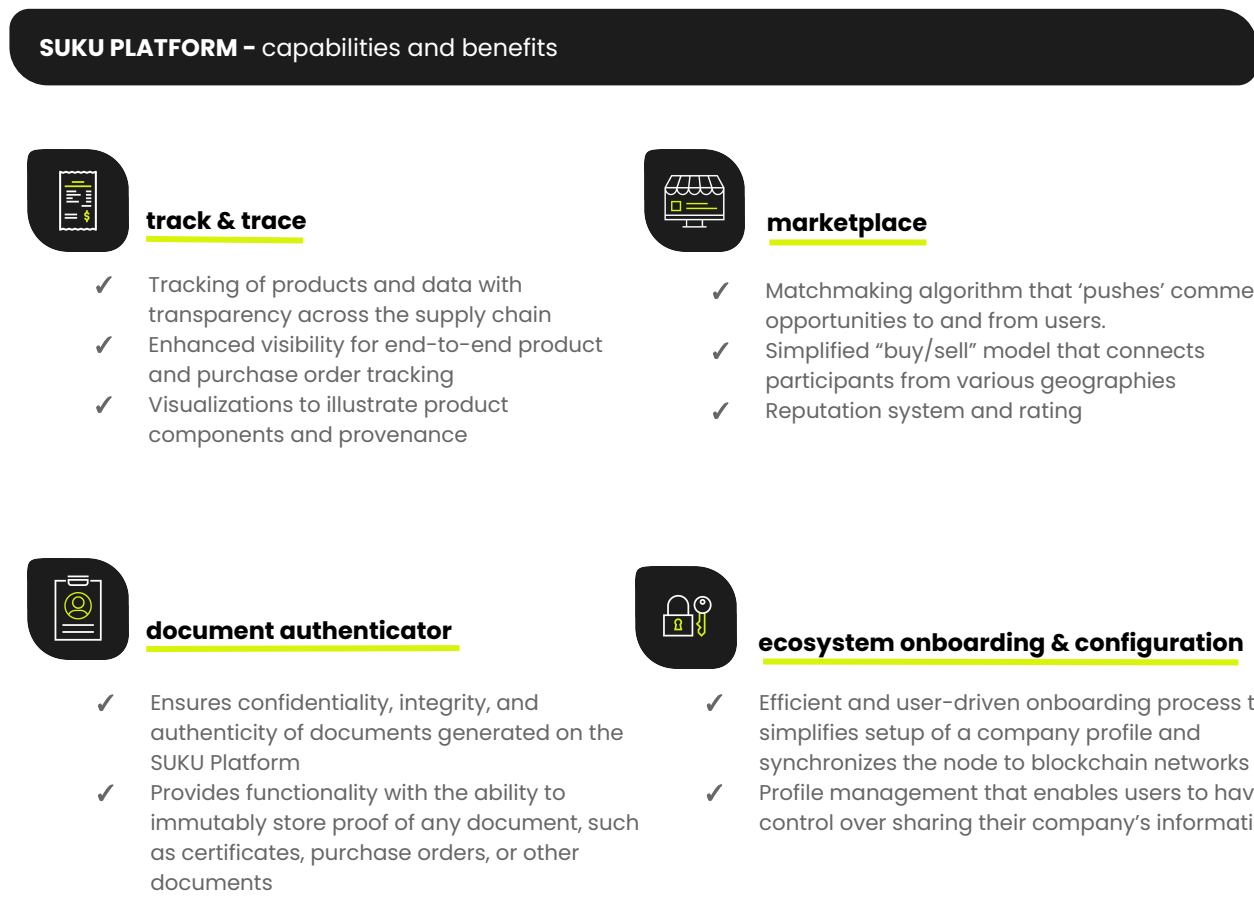


Figure 6: SUKU Platform - Capabilities and Benefits

## 3. SUKU Ecosystem



### 3.2.2. Application to Industries

The SUKU Ecosystem has been designed using an industry-agnostic approach, with our first use case being the livestock industry. The SUKU Ecosystem has been designed to support different industries through its foundational capabilities, which can be tailored to fit any set of supply chain participants. For example, the capability to track products from end-to-end throughout the supply chain has been built to support products in various industries.

### 3.3. Token

The SUKU Ecosystem uses an ERC20-compatible token called the SUKU Token. Both Trading Partners and Technology Partners use the token within the SUKU Ecosystem. The SUKU Token has the following platform uses:

- 1. Governance:** SUKU Tokens enable the right to vote. For example, one of the voting opportunities could be voting on proposals to improve the SUKU Core Layer
- 2. Transaction Fees:** For specific transactions where the SUKU Core Layer is used, as explained in Section 4.2, a fee is collected that will be split between the SUKU Core Token Reserve and SUKU Node operators. Also, Technology Partners may design applications or services which earn SUKU Tokens as well
- 3. Rewards / Incentives:** SUKU Tokens reward users of the platform. For example, after onboarding onto the SUKU Platform, the user receives a SUKU Token reward to seed their wallet with SUKU Tokens to interact on the SUKU Platform

### 3.4. Trading Partners

Who are these users and how do they use core capabilities within the SUKU Ecosystem? Trading Partners, such as suppliers, manufacturers, distributors, and retailers, will utilize the capabilities of the SUKU Platform to transact with one another. Participants can start utilizing the SUKU Platform once their profiles are completed during the onboarding process, resulting in the ability to begin transacting on the Marketplace or tracking goods via the Track and Trace capabilities.

In addition to using the SUKU Platform capabilities, Trading Partners can manage nodes within the SUKU Ecosystem; node design and node management are further detailed in section 4, SUKU Architecture. By running a node, Trading Partners receive access to the SUKU Ecosystem, allowing them to utilize all SUKU Core functionality, as well as SUKU Applications and Services.



### 3.5. Technology Partners

To build an open, distributed network for Trading Partners, Technology Partners and developers assist in the ongoing development of the SUKU Platform. Given that the SUKU Platform provides open access to users, we encourage developer community involvement in the build-out of additional supply chain applications and services for the SUKU Platform and Ecosystem.

#### 3.5.1. Technology Partners and Developers

Technology Partners and developers can receive incentives for building applications and tools on top of the SUKU Core Layer. These incentives are distributed in phases according to milestones defined with these parties. For instance, a portion of the incentive may be disbursed at the project start, and the remaining may be given based on deliverables and milestones accomplished. For Technology Partners and developers that assist in improving the SUKU Core Layer, one time incentives may also be given.

Technology Partners and developers may receive incentives that are distributed as transaction fees, which are paid by Trading Partners or other users of the SUKU Platform. Technology Partners and developers will be able to set fees for use of the applications they create. Often when their applications are used by Trading Partners, a share of the overall transaction fee will be sent to the Technology Partner or developer.

#### 3.5.2. Service Providers

Service Providers offering on-chain services may be incentivized in a manner similar to Technology Partners. When Trading Partners use a service, the Service Provider can charge a transaction fee in the form of SUKU Tokens. For example, purchasing insurance or shipping services is an example of auxiliary services that may be offered by Service Providers.

In addition to providing access to on-chain services, it's anticipated that off-chain services are available to Trading Partners, such as integration services to assist with integrating third-party systems (e.g., an in-house Enterprise Resource Planning system).





### 3.6. Incentivizing Platform Usage and Participation

To drive growth of the SUKU Ecosystem, we envision the utilization of an incentive model and transaction fees for both Trading Partners and Technology Partners. This incentive model aims to create a feedback loop between network participants, designed to be sustainable in the long term.

#### 3.6.1. Incentivizing Platform Usage for Trading Partners

To drive adoption of the SUKU Ecosystem by Trading Partners, incentives are being used. Specifically, the incentive model encourages three different types of platform interactions:

- 1. Use:** Actions on the platform, such as completing the review of a transaction
- 2. Join:** Onboarding and information input, such as node procurement
- 3. Promote:** Promotion of the SUKU Platform, such as Trading Partner referrals

#### 3.6.2. Incentivizing Technology Partners

Using an allocation from the Technology Partner Token Reserve (described further in Section 3.6.4), Technology Partner incentivization within the SUKU Ecosystem aims to achieve the following:

- 1.** Engage the community in the buildout of supply chain features for the platform at both the SUKU Core and SUKU App and Services Layers
- 2.** Incentive tokens drive adoption, attract developers, drive community interest, improve quality, and provide ongoing maintenance of the overall platform
- 3.** Distribute the tokens to the community over time

Technology Partners are incentivized for the following development activities on the platform:

- 1. SUKU Core Layer Development:** Opportunity to improve the SUKU Core Layer and receive a SUKU Token reward
- 2. SUKU Apps and Services Layer Development:** Technology Partners and developers can develop applications and services that add to the platform at the Application and Services Layer, which could result in collecting SUKU Tokens as transaction fees

The engagement of Technology Partners and developers may evolve over time with the initial focus of supporting the SUKU Core Layer.

### 3. SUKU Ecosystem



#### 3.6.3. Technology Partner Transaction Fee

A Technology Partner may decide to develop an application or module with the opportunity to collect transaction fees. When their applications and services are used, we expect there to be opportunities for Technology Partners to employ different transaction fee models for usage of applications that are created..

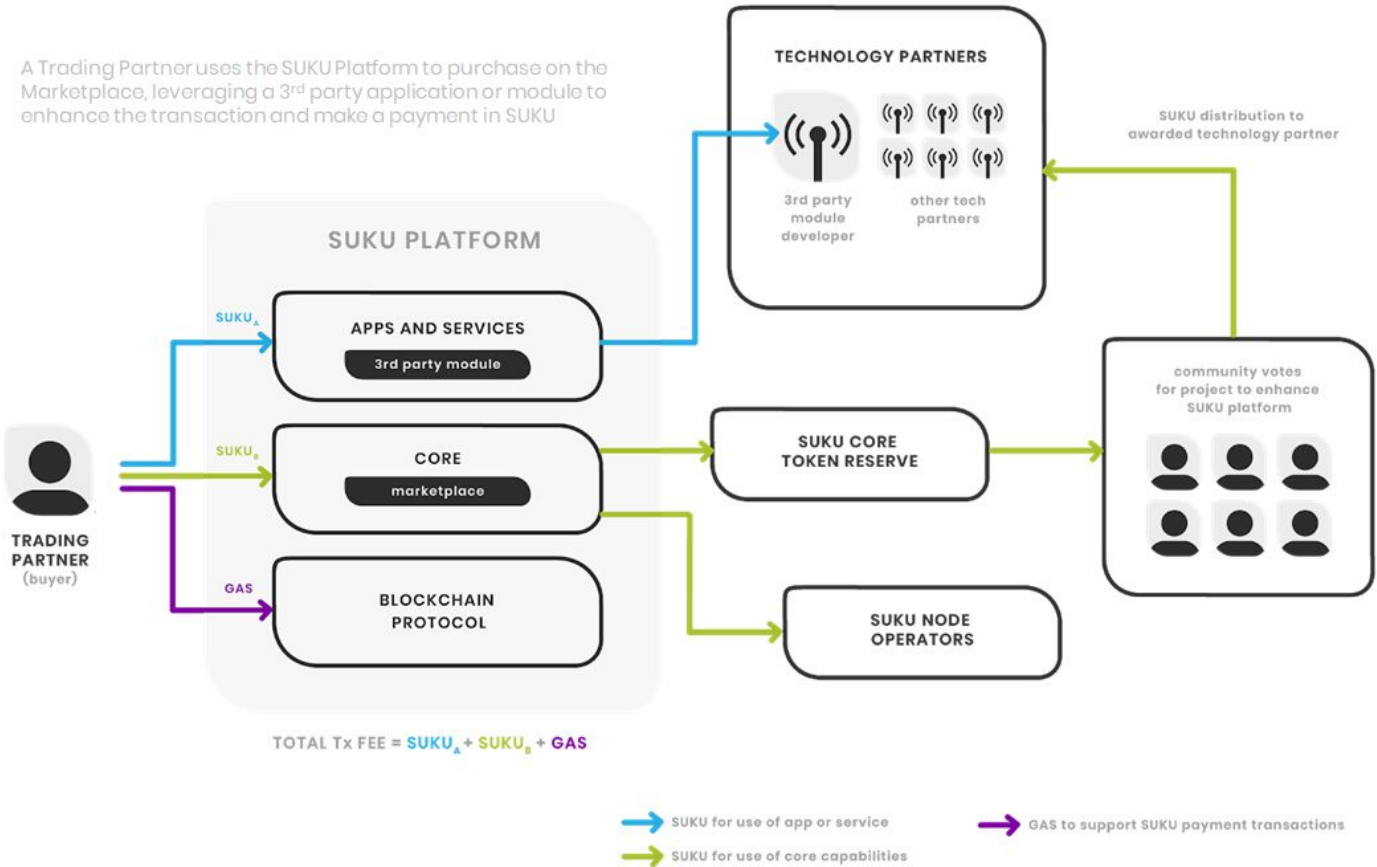


Figure 7: SUKU Token Flow for Technology Partners

#### 3.6.4. Token Reserves

We use token reserves as a means to reward Technology Partners for contributing to the SUKU Platform at either the SUKU Core Layer or at the SUKU Apps and Services Layer. A high-level overview of these token reserves is highlighted below.

- 1. Trading Partner Token Reserve:** Used for interaction-based Trading Partner incentives, which will have an allocation from the original token reserve. These incentives will be awarded as the Trading Partner completes transactions as described in section 3.6.1 Incentivizing Platform Usage for Trading Partners.
- 2. Technology Partner Token Reserve:** Used for Technology Partner incentives, which will also have an allocation from the original token reserve..
- 3. SUKU Core Token Reserve:** Used to incentivize enhancements to the SUKU Platform at the Core Layer.



### 4.1. Guiding Principles

In making SUKU Platform architecture decisions, three core guiding principles are continually followed:

1. **Modularity:** Creating an architecture that allows for an extensible platform, which encourages technological growth and longevity
2. **Standardization:** Utilizing standards across the architecture, expecting to enable platform interoperability and simplifying systems integration
3. **Usability:** Aiming to make our platform usable for participants, fostering SUKU Ecosystem adoption and platform sustainability

### 4.2. SUKU Architecture

The SUKU Ecosystem's functionality stems from the hierarchy of logical architecture; the SUKU Platform's supply chain capabilities are provided by four layers (Figure 8):

1. **Applications and Services Layer:** Allows for applications and services to be built on top of the SUKU Core Layer
2. **Core Layer:** Contains the core capabilities that participants will use on the SUKU Platform
3. **Blockchain Layer:** Upholds the integrity and security of transactions. SUKU is being built utilizing public Ethereum and permissioned Quorum
4. **Infrastructure Layer:** Operate nodes and infrastructure to support the aforementioned layers (e.g., Amazon Web Services, Azure, Google Cloud Services, etc.)

These four layers and other technical elements of the SUKU Architecture are detailed in the sections that follow.

## 4. SUKU Architecture

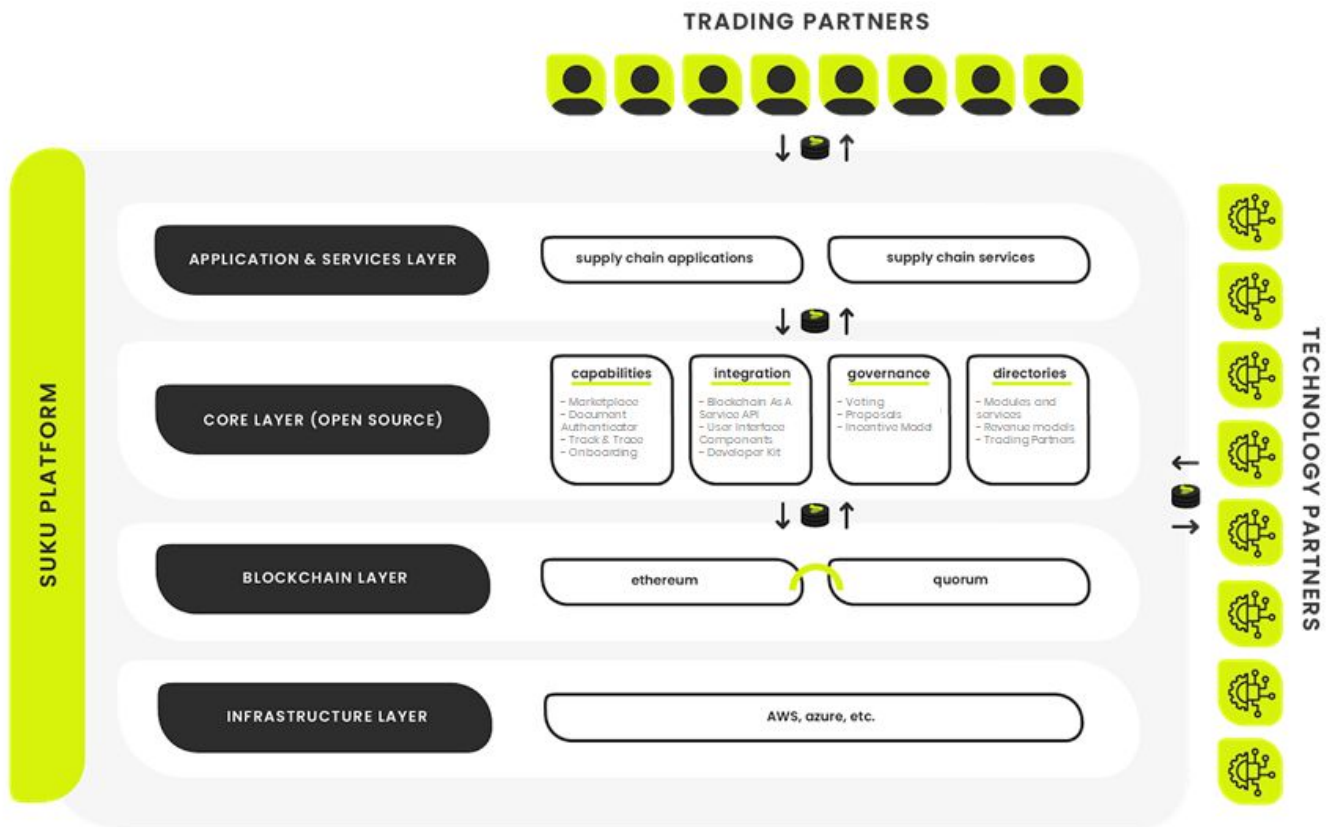


Figure 8: SUKU Platform Functional Architecture



### 4.2.1 Application and Service Layer

Applications and services are developed on the outermost layer of the SUKU Architecture, utilizing layers below to handle the complexities. These layers are typically accessed via an abstracted set of supply chain APIs. Details on these APIs and associated capabilities are further highlighted in Section 4.3.4.

#### Supply Chain Applications

We are collaborating with Technology Partners and developers on the SUKU Platform capabilities, in addition to the open sourced functions that are available as part of the SUKU Core Layer. Technology Partners and developers will leverage the SUKU standards set forth.

The Application and Service Layer is intended to enable potential revenue streams for developers through applications that they create. If Trading Partners use the applications on the SUKU Platform, Technology Partners may be rewarded with a portion of the transaction fee as described in Section 3.6.3. As participants use the applications on the network, transaction fees may be dispersed to the application developers.



## 4. SUKU Architecture

Given that the SUKU Core Layer intends to be open source, we will not control the scope of the applications that are introduced onto the SUKU Platform or how much Technology Partners and developers charge for the usage of their application. We anticipate the open market and platform capability will drive how application developers compete and what applications they decide to introduce.

### Supply Chain Services

In addition to providing core platform capabilities (as part of the SUKU Core Layer) and applications (as part of the Application and Service layer), the SUKU Ecosystem allows service providers to offer supply chain services to other network participants. We currently expect that Service Providers will be able to publish their services and associated revenue models, allowing network participants to purchase them.

Another consideration are services that may be outside of the SUKU Ecosystem (e.g., services that do not utilize the underlying technology, but provide value to users of the platform). As a result, these services are delivered off-chain; some examples of these services could include: technical support, consulting, and integration. These services would also be listed in the Directories, described on the next page, and offered to network participants.

### 4.2.2 Core Layer

#### Overview

The SUKU Core Layer serves as the foundational layer for the SUKU Platform. Section 3.2.1. Platform Capabilities introduced the foundational capabilities, however, the SUKU Core Layer also provides:

1. Abstraction
2. Technology Partner and developer access to build additional applications and services
3. Supply chain features and capabilities

First, the SUKU Core Layer acts as the abstraction layer between the Blockchain Layer and applications and services that are offered as part of the Application and Service Layer.

Second, it enables Technology Partners and developers access to APIs, data standards, and microservices to build on top of the foundational code base. By providing access to third-party developers, they will be able to develop applications and services based on the market needs of the users of the SUKU Platform.

Third, the SUKU Core Layer provides the SUKU Platform capabilities (e.g., Track and Trace), which will be accessed directly via a user interface by Trading Partners.

#### User Interface

To maintain a consistent look and feel across applications and services, the SUKU Platform encourages the use of user interface standards and SUKU developed web components.



### Directories

The Directories feature is anticipated to have the following primary functions:

- 1. Listing of services and application proposals:** Allows Technology Partners, developers, and Service Providers to submit their applications and services ideas for consideration by Trading Partners.
- 2. Listing of Trading Partners who are on the SUKU Platform:** A directory service, which provides information companies and Trading Partners who are also using the SUKU Platform.

### 4.2.3 Blockchain Layer

The SUKU Platform is composed of public Ethereum and permissioned Quorum. This means that each node on the network consists of a permissioned Quorum blockchain node and a public Ethereum blockchain node.

Public Ethereum provides a mature and widely-used blockchain platform, which has been utilized extensively for token sales and other smart contract deployments. The Ethereum Virtual Machine (EVM) enables flexibility for programming smart contracts on the blockchain, including the creation of the SUKU Token, which will use the ERC20 standard. A substantial number of wallets and projects use the ERC20 protocol to standardize operations and transactions, allowing for increased access and broader adoption of SUKU Tokens.

The public Ethereum blockchain allows for SUKU Token transfers. Public Ethereum provides immutability and transparency on a global scale to provide SUKU Trading Partners with the capability to manage and trace transactions.

Quorum, a permissioned and private blockchain based on Ethereum, allows for encrypted transactions within the SUKU Platform, including marketplace and supply chain functionality. Quorum's private data vaults, transaction manager, and consensus mechanism provide capabilities that focus on private, permissioned blockchain networks. The Permission Layer of Quorum allows for private transactions within a predefined group of known participants (such as bids or private offers, among others).

As a result, the combination of permissioned Quorum and public Ethereum intends to provide a rich blockchain solution for the SUKU Platform to leverage.

### 4.2.4 Infrastructure Layer

When deploying a SUKU Node, the node operator will have the option to deploy its node independently or through an automated node deployment. Our solution offers a multi-chain, multi-cloud network management solution that can deploy nodes and connect them to blockchains. This cloud-based node deployment strategy expects to pave the way for an efficient node integration, therefore helping to facilitate the growth of the network.



### Database Integrity

Based on the architecture design, every node in the SUKU Ecosystem associates two database instances. One instance holds individual local data and another shared instance stores data that is visible to all participants. The shared database stores data related to the Marketplace, Track & Trace, and Document Authenticator that are accessible across nodes.

To improve the integrity of this solution, the SUKU Platform includes an additional integrity layer that stores a hash value of key data on the permissioned Quorum blockchain. The hash is validated whenever data (such as a document) is selected to be retrieved from one of the databases to ensure that the data has not been changed or tampered with.

### Security Standards

The permissioned SUKU Platform uses a hybrid encryption model and leverages well-established cryptographic primitives. Xsalsa20 is used as a symmetric stream cipher and Curve25519 serves as an asymmetric elliptic curve cipher. Additionally, Poly1305 is used as a message authentication code (MAC). The SUKU Platform leverages well-tested algorithm implementations from the Networking and Cryptography library (NaCl).

## 4.3. Node Design

### 4.3.1 SUKU Node Design Overview

The primary purpose of a SUKU Node is to support the SUKU Ecosystem by maintaining a copy of the permissioned Quorum blockchain. In addition to giving access to the public and private transactions on Quorum, the node provides access to the public Ethereum blockchain, which will be used to handle platform payments and SUKU Token transfers.

A key component of each node is the Quorum transaction manager that stores the transaction payload and state that the respective node is privy to; hashes of the respective state are stored on the Quorum blockchain. Business logic of private transactions is executed in the EVM of the transaction manager. The data of a private transaction is encrypted with the public key of a node and stored in its private data storage, the private data vault so that only the node itself can decrypt it with its private key. A hash of the private transaction is written to the public part of the permissioned Quorum blockchain.



### 4.3.2 Ethereum and Quorum Blockchain Interactions

For the SUKU Platform, public Ethereum and permissioned Quorum blockchains are used. While confidentiality and privacy are desirable attributes on the permissioned SUKU Platform, the SUKU Token must be open and accessible.

As a result, when a payment is made on the SUKU Platform, two transactions should execute; one transaction facilitates the exchange of goods on the permissioned Quorum blockchain, while another transaction executes the payment on public Ethereum.

These two transactions need to be linked, which is accomplished via the SUKU Node (a dual connection node) that has access to both chains and stores a reference of two related transactions in a smart contract on the permissioned Quorum blockchain.

To store the private data, it leverages private data vaults that hold a copy of the encrypted payload. The data inside of private data vaults is not shared amongst all nodes, but only accessible to certain participants (e.g., those involved in the transaction and those who require access to it). While the content of a private transaction is only shared with permissioned network participants, the associated hash is shared and publicly visible on the shared permissioned blockchain. This ensures data integrity and maintains a shared view of the distributed ledger and all transactions in the system. Quorum's privacy vaults use well-established cryptography standards to ensure that information is never exposed to non-privileged parties.

Token balances are public, yet pseudonymous and are implemented by a publicly accessible token smart contract. Transactions can be seen on the public Ethereum blockchain and pseudonymously tracked on the blockchain. However, wallet addresses will be generated programmatically and will not be associated with any personal information.

### 4.3.3 Key Management

The confidentiality of the blockchain model described in this section relies on key management and the secrecy of private keys. Each node holds one key pair for the permissioned part of the SUKU Platform and a separate key pair for the public Ethereum connection.

The SUKU Platform adopts the Quorum protocol standard and utilizes its key formats and signature algorithms for permissioned transactions. Thus, keys can be secured in Quorum's privacy enclaves within each node. The architecture that is introduced in this section encrypts transactions on the Application and Services Layer to maintain the confidentiality of the supply chain system. The concept uses Quorum's private data vaults that are located on each of the nodes and locally run smart contract logic in a separate EVM. This concept allows for private smart contracts and transactions to access data, which is limited to a certain group of nodes.

SUKU Token transactions are managed on the public Ethereum blockchain. Private keys for public Ethereum are stored in software-based key enclaves based on Hashicorp Vault that use strong cryptographic encryption algorithms to securely store and protect private keys.





### 4.3.4 SUKU Supply Chain Integration Strategy

#### Blockchain-as-a-Service

SUKU provides flexibility for integration into the platform based on the goals, needs and requirements of the integration partner. The integration strategy consists of integrations at multiple layers of the SUKU Platform. The following describes examples of these integration layers.

The outermost layer of the SUKU Platform Node will be the SUKU Blockchain-as-a-Service interface. This interface is expected to be available to any participant that runs a node and wishes to integrate their infrastructure or systems (e.g., legacy ERP) with the SUKU Platform. This service could be utilized to augment traditionally centralized solutions. For example a traceability software may need a blockchain layer to aggregate the transaction flow across participants. The SUKU Blockchain-as-a-service interfaces are intended to offer the following features:

- 1. Access to SUKU Node Services:** Provide the ability for integrators to create custom views of their node
- 2. Access to other nodes on the SUKU Platform:** Provide the ability to communicate with other nodes in the network
- 3. Access to third-party integration:** Provide the ability to Integrate their existing systems (e.g., legacy ERP, Inventory Management, etc.) with the SUKU Blockchain-as-a-Service interface.

#### SUKU Application & Services Layer

The SUKU Application & Services Layer supports the building of new trading partner use cases and modules, such as the integration to a specific marketplace for a particular industry.

Additionally, the SUKU platform supports building technical modules through our Blockchain-as-a-Service interface offerings for partners through our REST APIs. Other integrations like connections to existing ERP or inventory management systems could occur at this layer.

#### SUKU Core Layer

Capabilities at this level are part of the core SUKU solution that contains openly accessible functionality, which exists in all nodes of the SUKU Platform. Core modules include the baseline marketplace, track and trace, and document authenticator.

The modules integrated and included in this layer are managed by the ecosystem participants. The Core Layer persists across all nodes, whereas participants can subscribe to Modules at the Application & Services Layer, which is described above.

## 4. SUKU Architecture



### Public ERC20 Token Integration

The SUKU Token is a public ERC20-compatible token, which exists on the public Ethereum blockchain. Through the use of this token, SUKU integrates additional public blockchain functionality. For example, the SUKU Token is expected to be used in the governance process (as described in section 3.3 Token).

### SUKU Development Kit

The SUKU Development Kit will contain a number of software development tools to enable developers to enrich the SUKU Platform and create platform-specific functionality. The Development Kit is tailored to all levels of experience to help make SUKU application development as accessible as possible. The SUKU Development Kit is composed of the following

1. **SUKU Docs:** Quick reference coding documentation
2. **Developer Guides:** Guides to aid the development process
3. **SUKU Web Components Library:** A library of documented SUKU Angular web components with an included sandbox feature
4. **SUKU Blockchain-as-a-Service Interface:** Documented RESTful API to integrate external applications with the SUKU Platform. The initial scope of these APIs includes Track & Trace and Document Authenticator capabilities
5. **Technical Integration Examples:** Integration walk-throughs to make building SUKU applications as straightforward as possible

## 4.4. The SUKU Network and Transactions

The SUKU Ecosystem consists of all the nodes participating in the network. For the SUKU Platform, each SUKU Node consists of a permissioned Quorum blockchain node and a public Ethereum blockchain node. This set of SUKU Nodes – each managed by a SUKU Platform Trading Partner – is expected to form the network of participants who submit transactions, vote on the consensus of transactions, and interact with each other using smart contracts.

For the SUKU Platform, a supply chain node is considered a “dual-connection” node because every participant is connected to both public Ethereum and permissioned Quorum blockchains. A SUKU Platform transaction (e.g., a platform transaction and a corresponding payment) requires two transactions (one on public Ethereum and one on permissioned Quorum). Additional transactions on the permissioned blockchain are utilized to reference token payments as a single transaction.

The validation is implemented on the Application and Services Layer that is part of every node. This scheme relies on the node implementation and does not require a change of the Quorum core code. Sections 4.4.1 (Figure 9) and 4.4.2 (Figure 10) demonstrate private and public transactions and how they would occur within the SUKU Platform.

# 4. SUKU Architecture



## 4.4.1 Private Transactions

As depicted below (Figure 9), in a transaction by User B on the SUKU Platform (e.g., a bid by User B in response to User A's offer), User B enters bid details in the application that is part of User B's node (e.g., run by User B's company). User B's web application creates an object, stores a shared copy on the shared DB and writes a hash of the object to the Quorum blockchain. User A's node (e.g., run by User A's company) will read the information and validate its integrity by calculating its hash and comparing the result with the hash value stored on the blockchain.

User A can now request to view pertinent bids in the shared database – Node A's marketplace application queries the shared database for bids with Node A's public key in the metadata. It then verifies the integrity of the object returned (like the Verification of the Offer process in a public transaction), decrypts the object with Node A's private key, and returns the bid details to be displayed to the user.

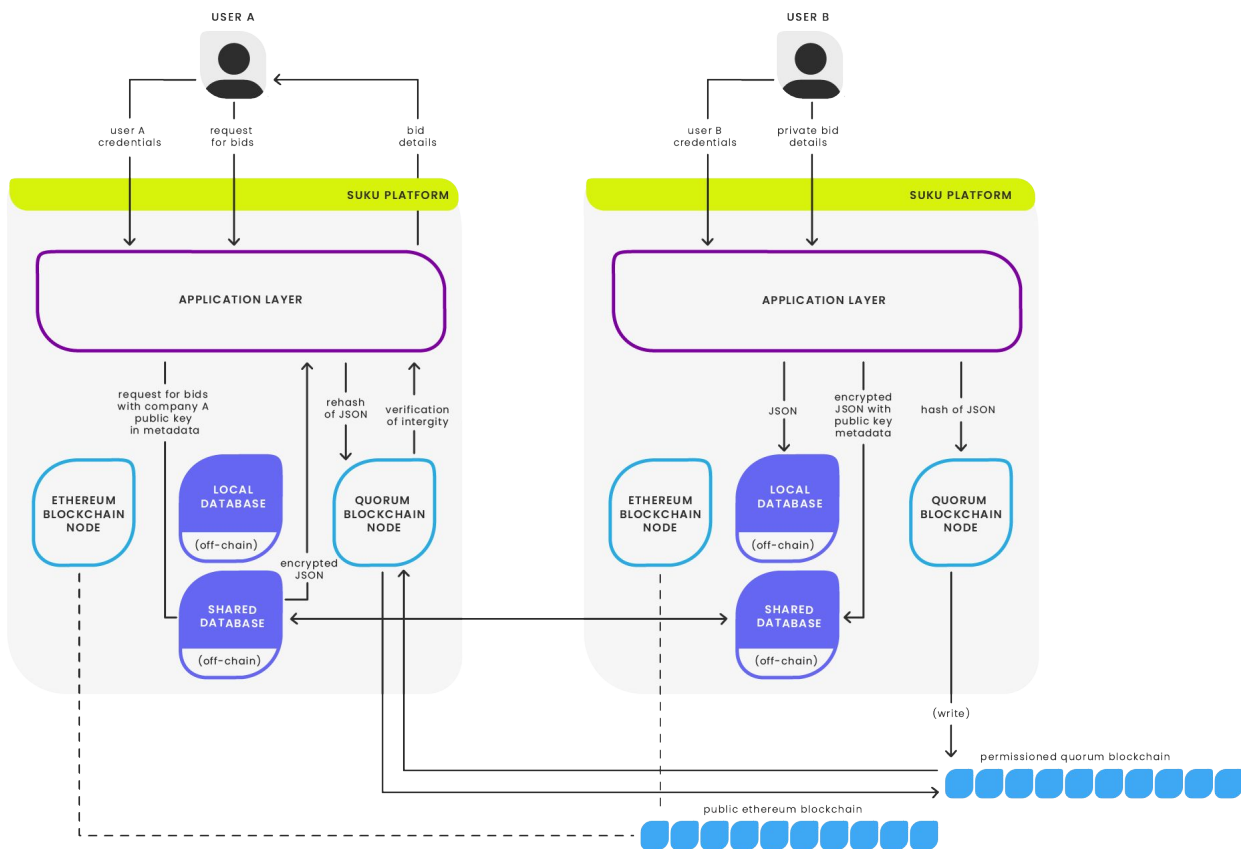


Figure 9: Private Transaction



# 4. SUKU Architecture

## 4.4.2 Public Transactions

A user-friendly browser application will provide an easy way to interact with the blockchain and the underlying supply chain logic. As depicted below (Figure 10), in a public transaction on the SUKU Platform (such as an RFP placed on the Marketplace by a seller), User A enters the details of a transaction on User A's node. Node A's marketplace application creates a transaction object that is posted to a shared database and creates a hash of this object and writes it to the private blockchain.

When User B requests to view all offers, this request is passed to the application that queries the shared database for open public offers; the transaction object that User A posted will be returned. Node B's application rehashes the transaction object returned and verifies that this new hash is identical to the one that User A wrote to the private blockchain (to ensure the integrity of the offer). If the hashes do not match, the application logic marks the transaction as invalid and that it has been altered.

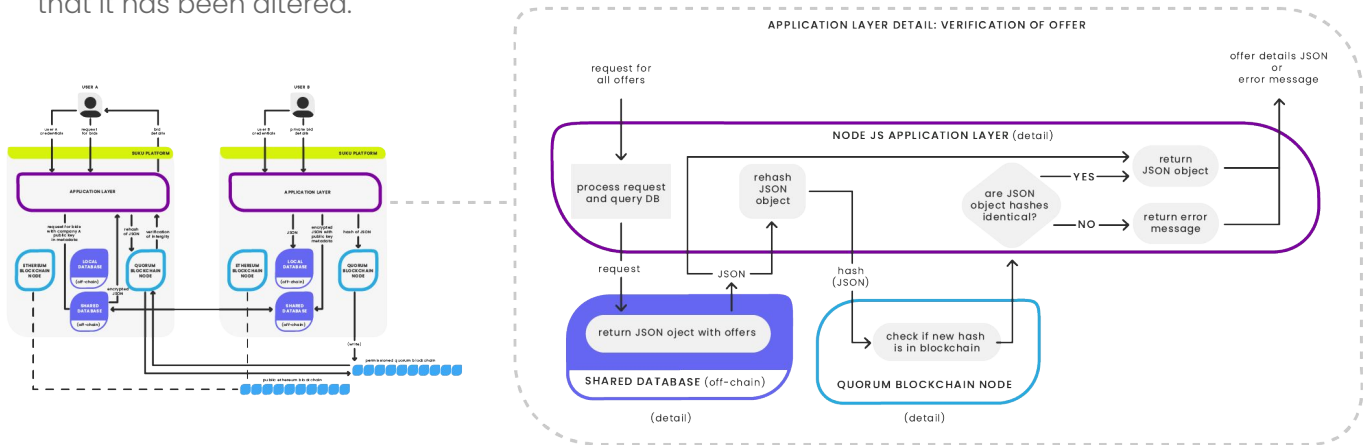


Figure 10: Public Transaction

## 4.5 Node Onboarding

To foster a growing network, new nodes are expected to be onboarded dynamically, providing the ability to consistently add new network participants. Dynamically adding nodes allows new SUKU Node operators to engage with the existing functionality of the SUKU Platform. As nodes join and leave the network dynamically, the underlying state of the blockchain remains intact and continues functioning.

As new nodes request to participate on the network, existing nodes will have to approve and add the new node to their respective peers. This ensures that the node onboarding process remains democratic; each node must individually accept the integration of a new node. If a node acts in a malicious manner, other nodes can simply stop communicating with it.



## 5. Team & Advisors

### 5.1. Team

We have brought together a talented team with experience in blockchain, supply chain management, and finance to build SUKU.

#### **Yonathan Lapchik, Chief Executive Officer (CEO)**

Yonathan is a blockchain specialist with a strong business and technology background. He brings more than 12 years of experience helping Fortune 500 clients with digital transformations, M&A, tech strategy, and product implementation working for TATA Consultancy Services and Deloitte. Before joining, Yonathan held the role of Product Lead for Deloitte's US Blockchain Lab, focusing on leading the development of blockchain-based prototypes and enterprise solutions. In alignment with the lab's mission, Yonathan served as an in-house blockchain subject matter advisor for fellow Deloitte practitioners and clients alike. Yonathan holds an MBA from Duke University, The Fuqua School of Business (Strategy concentration) and a BSc in Computer Science Engineering from Universidad ORT Uruguay.

#### **James Bower, Chairman & Co-Founder**

James is an entrepreneur and executive with over 20 years of diverse experience in the technology, medical, entertainment, and financial industries. From 2014 to 2017, James was a partner and hardware R&D advisor for VaxCare, the largest domestic provider of SaaS based end-to-end pharmaceutical supply chain management solutions. Prior to that, James was the founder, inventor, and CEO of Gamevice, a gaming tablet and a patented video game controller for Apple & Samsung tablets and smartphones. James has led several M&A transactions and turn-around ventures in his career and has accumulated 16 patents. James majored in Business Marketing at the University of North Florida.

#### **Addison McKenzie, President & Co-Founder**

Addison is a seasoned entrepreneur with over 20 years of experience founding and growing businesses in diverse sectors. While studying for his mechanical engineering degree in Vermont, he started a home building company, which grew substantially over a short period of time. Following that, Addison started a software company on which his team-built SaaS products for sales and marketing organizations. These back-office solutions were transformational for the organizations in which they were deployed, resulting in increases of tens of millions of dollars in sales. Addison created the foundational concept behind SUKU.

#### **Lucas Henning, Chief Technology Officer**

Lucas has a deep technical background in Blockchain, cryptography, cyber security. Lucas has extensive project experience in blockchain platform development, web application security, ISMS, SIEM and Penetration Testing. He has led the development of blockchain applications written in Solidity, Go, and JavaScript-based on Ethereum, Hyperledger, and other blockchain platforms. Before joining, Lucas worked as a Technical Blockchain Architect for the Deloitte Blockchain Lab in Germany, Ireland, and NYC where he was responsible for the design and implementation of decentralized applications. Lucas has 8 years of experience working in the Blockchain and cybersecurity space, holds a master's degree in Cyber Security from the University of Hamburg, and holds a CISSP certification.



## 5. Team & Advisors

### **Shannon Coble, Chief of Staff & Co-Founder**

Shannon has over 12 years of expertise in business strategy development, operational process improvement, and supply chain management and analytics. After serving six years in the United States Air Force, she worked in Strategy & Operations at Deloitte Consulting, where she advised federal clients on improving operations and shaping business process strategies. She advised director-level clients at the Defense Logistics Agency by providing data-driven supply chain management solutions to improve the efficiencies in acquiring and providing weapons and supplies to U.S. military troops. Shannon also worked in the financial sector at Wells Fargo Advisors, where she focused on building high-profile relationships with enterprise partners.

### **Thane Tokerud, Financial Controller**

Thane is an actively licensed Certified Public Accountant with expertise in designing tax strategies for leading technology companies, including pre-ICO and post-ICO plans for blockchain technology businesses. Formerly at Deloitte in San Francisco, Thane has advised both private and public companies in diverse sectors, including consumer services and technology with an emphasis on SAAS, biotech, and blockchain. Thane is a member of the American Institute of Certified Public Accountants and holds a Masters of Accountancy degree from the University of Notre Dame.

### **Martin Kaczynski, Director of Product & Operations**

Martin is an experienced operations professional and former Manager at Deloitte who has delivered strategy and agile technology projects across insurance and banking. Prior to joining, Martin was managing blockchain projects at Deloitte and helping to build its Blockchain practice. Martin is the SUKU Product Manager leading the product strategy and the agile implementation of the SUKU Platform. Martin holds a Bachelor of Engineering and Management (B.Eng.Mgmt., Software Engineering) and an MBA from Duke University, The Fuqua School of Business (Finance and Strategy concentrations).

### **Garrett Lee, Product Manager**

Garrett has work experience at Deloitte Consulting, coordinating with the Blockchain Lab in NYC to advise clients on various solutions and develop insightful blockchain-focused materials. Garrett also has a background in informatics and mathematics, holding two Bachelor degrees from Indiana University. Garrett works as a Product Manager, owning various aspects of SUKU's product suite to execute on data-driven results in a customer-friendly fashion.



## 5. Team & Advisors

### **Bryce Doganer, Blockchain Engineer**

Bryce has eight years of experience in engineering & software management roles with a specialization in blockchain integration over the past three years. He worked as the blockchain research specialist at Private Key Assets compiling research on various blockchain strategies and implementations. During this period he founded DApples, a decentralized application firm focused on developing blockchain based web applications. With expertise in full-stack development, Bryce is an integral part of the technology team, assisting with the design, integration and development of the SUKU platform. He earned his engineering degree from the United States Merchant Marine Academy.

### **Paris Reid, Strategic Relations**

Paris has over 10 years experience in building sales and marketing organizations across multiple industries. She is a certified advisor in leadership development, and has advised dozens of entrepreneurs on increasing their sales through improved communications and marketing. Paris has also advised companies on promoting company culture through team-building and relationship management. Paris excels in recruiting and onboarding highly qualified talent.

### **Ian Campbell, Product and Business Development Analyst**

Ian has experience in sales, product management, and the overall financial industry from being a financial institutions underwriter at CNA Insurance. During his tenure, he was the companies cryptocurrency subject matter expert and worked on multiple deals to insure various well known entities in the crypto space. Ian graduated Summa Cum Laude from Seton Hall University with a degree in mathematical finance where he also swam Division I all four years. Outside of that, Ian has worked on a number of other passion projects in the space including decentralized gaming and helping start up a self-regulatory organization. In his current role, Ian works on managing various product streams and helping with business development.

## 5. Team & Advisors



### SUKU Development Team

The SUKU Development Team consists of co-located, developers who have been working together over the past year building the SUKU Platform. The team consists of the following:

- **Blockchain Developers** with experience in Truffle based Solidity development, Mocha Chai based smart contract testing, and Web3 integration.
- **Full Stack Developers** with experience building microservice based multi-layer web solutions based on the MEAN stack, J2EE, and Golang.
- **UX/UI Engineers** with experience in single page application development and mobile-first web design, based on Angular, React, and other frameworks.
- **Database Engineers** with experience designing and integrating data layers based on MongoDB, DynamoDB, and Cassandra.
- **Backend Integration and Interface Engineers** with experience in designing RESTful applications and integration based on Express, Swagger, and Spring.
- **DevOps Engineers** with CI/CD experience, including Docker, Ansible, and Selenium.
- **Test Engineers** with experience in manual and automation testing using tools such as Karma, Mocha, Chai, Protractor, SonarQube, and others.
- **SCRUM Masters** with experience in leading agile sprint cycles and coordinating the needs of various stakeholders.





## 5. Team & Advisors

### 5.2. Advisors

We have brought together an advisor team with extensive experience in blockchain, supply chain management, and finance.

#### **Bill Shihara, Co-Founder and CEO of Bittrex Exchange**

Bill Shihara is co-founder and CEO of Bittrex, a leading US-based digital asset trading platform. In addition to his significant blockchain expertise, he brings nearly two decades of cybersecurity experience, most recently serving as Security Engineering Manager at Amazon, and the Manager of Security Threat Analysis and Security Engineering at BlackBerry. Prior to his position at BlackBerry, Shihara spent several years at Microsoft working on the Trustworthy Computing team and on the Windows Operating System.

#### **Campbell Harvey, Blockchain and Finance Professor at Duke University**

Professor Harvey is a world-renowned Finance and Blockchain Professor at Duke University and a Research Associate at the National Bureau of Economic Research. He completed his doctorate in Finance at the University of Chicago and has published over 125 scholarly articles on a wide range of topics. He is also a Partner to Research Affiliates, LLC and an Investment Strategy Advisor to Man Group, PLC contributing to both research and product design. Professor Harvey is the sponsor of the Duke Blockchain Lab opened with SUKU earlier this year.

#### **Jack Lee, Founding Managing Partner, HCM Capital-Foxconn**

Jack Lee is a Founding Managing Partner of HCM Capital. He is also co-founder and Executive Director of Chained Finance Ltd., a blockchain-based automatic supply chain finance company, and founder and Executive Director of Foxconn Finance Platform. Prior to his current roles, Lee was an investment director at Foxconn Technology Group and worked extensively in investment banking and capital markets for Taiwan-based Yuanta Polaris Financial Group, JPMorgan, and Citi, and others.

#### **Lily Liu, Co-founder of Earn.com**

Lily Liu is co-founder and former CFO of Earn.com, a blockchain-based platform that is making it possible to use digital currency to send and receive targeted, paid microtasks. She brings a strong background of financial experience, having held positions at KKR and McKinsey & Company, as well as serving as Chief Financial Officer at Chinaco Healthcare Corporation.

#### **Matthew Roszak, Co-Founder, Bloq | Founding Partner, Tally Capital**

Matthew Roszak is co-founder and Chairman of Bloq, a leading blockchain technology company. He is also Founding Partner of Tally Capital, a private investment firm focused on cryptocurrencies and blockchain-enabled technology with a portfolio of over 50 direct investments, including Binance, Block.One, Civic, Orchid, tZERO, Qtum, and more.

#### **Mike Wheaton, Technical Advisor | Former Technical Director at Oracle Sun**

Michael has 25 years of leadership, strategic planning, and deep expertise in enterprise architecture. He founded Agile Clouds and directs the delivery of modernization projects using cloud, blockchain, and docker technologies. Prior to Agile Clouds, Michael was a technical Director at Oracle where he managed projects in the oil and gas, cellular, and utility industries.



## 5. Team & Advisors

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### **Hunter Newby, Advisor | Owner of Newby Ventures**

Hunter Newby is an American entrepreneur, investor, conservationist and the owner of Newby Ventures. His primary field of interest has been network infrastructure. As Co-Founder, Chief Strategy Officer and a Director of Telx, he pioneered the carrier-neutral Meet-Me-Room and the development of carrier hotels and data centers in the United States leading to massive value creation and economic development throughout the Country. Since the sale of Telx he has been and continues to be a founder, developer and investor in the creation of multiple network-neutral infrastructure businesses all across North America.



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