cobe.

Whitepaper

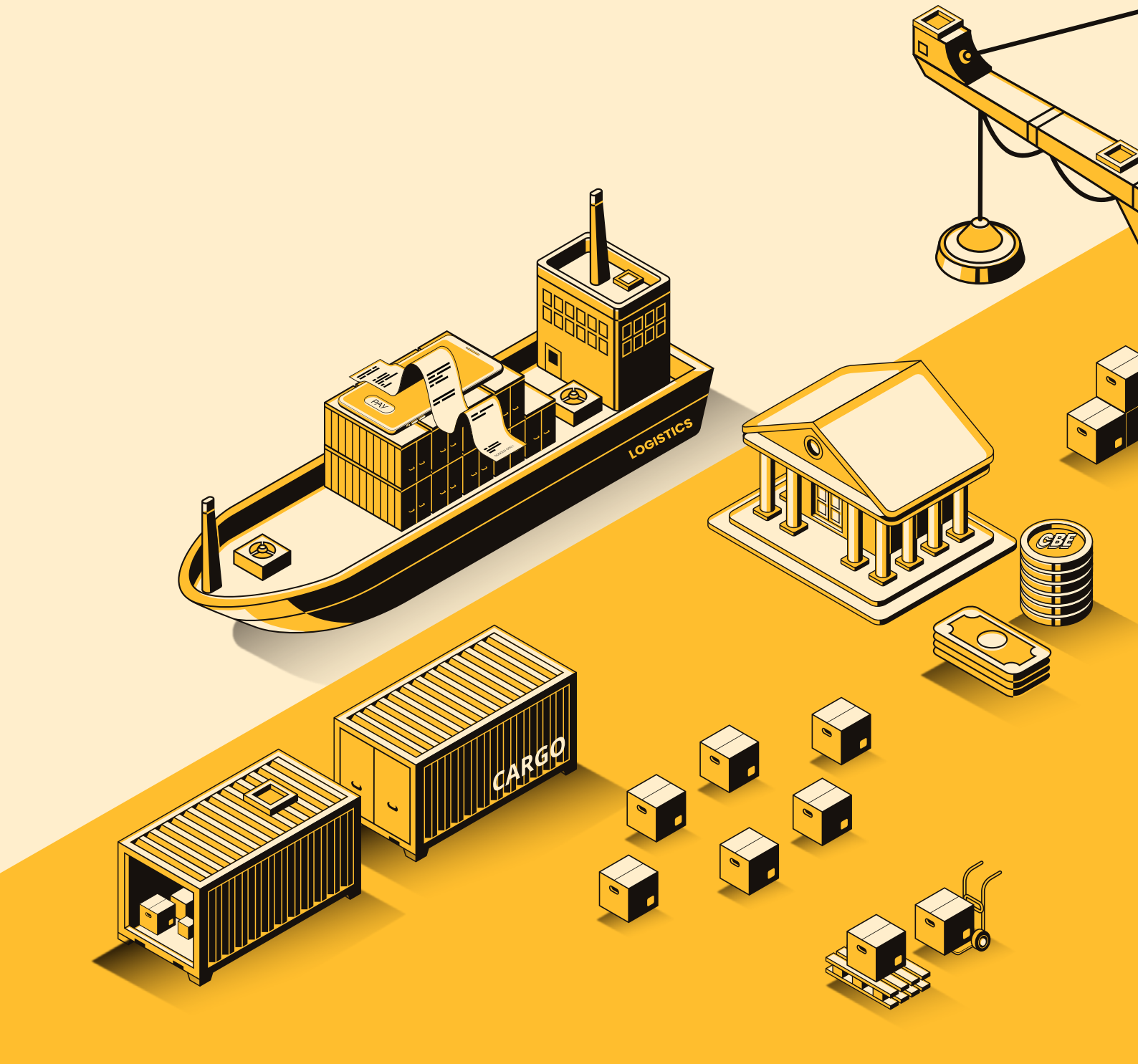


Table of Contents

Executive Summary

By removing the barriers that make cross-border trade a real challenge, Cobe will enable millions of people who are currently excluded from the world economy to participate and find their place.

In this paper, we identify that to effectively meet the demands of cross-border trade, a blockchain solution must offer both permissioned and permissionless chains working in synergy.

This is because a permissionless chain is better for transparency and participation whilst a permissioned chain is better for confidentiality and fixed transaction fees.

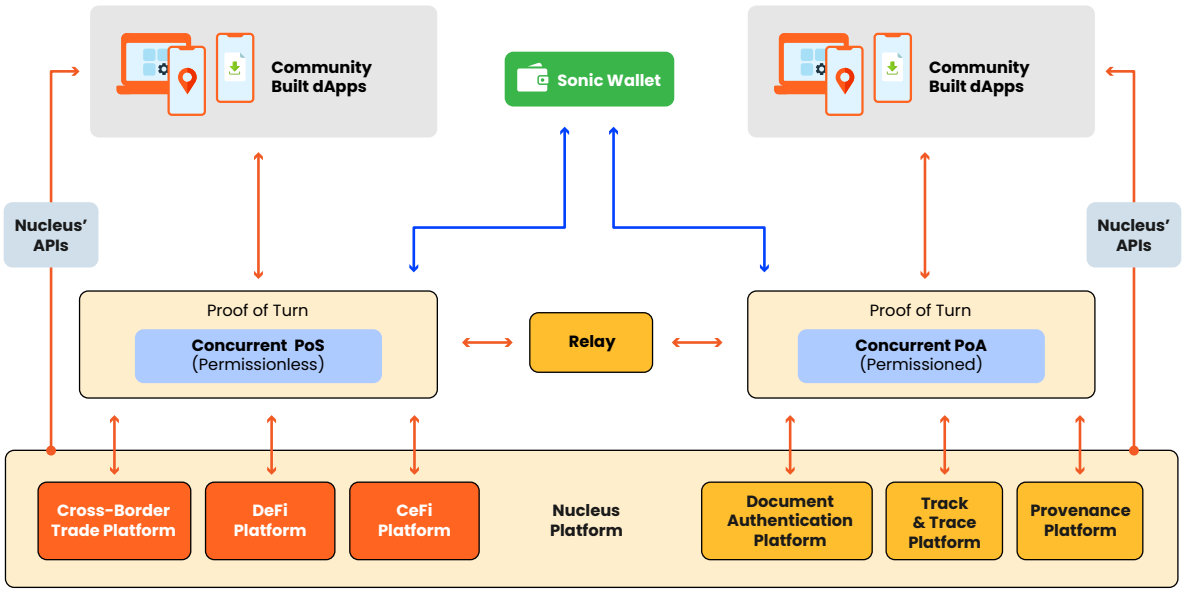
At present, no such solution exists.

Cobe has tackled this challenge by developing a unique dual-sided blockchain architecture. It includes a permissioned Proof of Authority chain offering a high level of confidentiality and fixed transaction fees on one side and a permissionless Proof of Stake chain offering a high degree of transparency and participation on the other.

No other blockchain provides this type of holistic solution to building cross-border trade applications, giving Cobe a distinct competitive advantage.

In addition, Cobe has developed its own novel 'Proof of Turn' (PoT) consensus protocol, which will work in synergy with both its Proof of Stake and Proof of Authority protocols to boost transaction speeds and lower costs.

Going a step further, Cobe has developed cutting edge concurrency protocols to dramatically increase transaction speeds. These ground-breaking protocols position Cobe as one of the most powerful blockchains to date.



For a detailed technical understanding of Cobe's dual-sided blockchain architecture, consensus protocols, virtual machine, and use of concurrency, please see Cobe's yellow paper, which is available at www.cobe.network

Cobe is also launching its very own native cross-border trade platform, named Nucleus. This consists of a suite of applications built on top of the its blockchain.

Nucleus will target the three fundamental challenges that pose major obstacles to cross-border trade. They are:

- **Trust:** By providing a powerful alternative to Letters of Credit (LC), Nucleus will give millions of individuals currently unable to participate in global trade the ability to do so. Nucleus's smart escrow facility takes minutes to set up, as opposed to the weeks/months that a typical LC requires, all at around 1/10 of the cost.

- **Finance:** Nucleus will provide easy and low-cost access to decentralized finance (DeFi) for cross-border trade. With the ability to synergize lending with individual cross-border trade transactions, and its unique user rating system, Nucleus will be able to offer both buyers and sellers the lowest cost borrowing.

- **Product Authentication:** Nucleus will take the most comprehensive approach to authentication, including document validation, track & trace, and provenance.

For those looking to build cross-border trade dApps on Cobe's blockchain, the Nucleus platform provides significant advantages. These include:

- **Integration with Nucleus APIs:** DApp developers on Cobe's blockchain will

be able to utilize its native platform Nucleus's smart escrow, DeFi, CeFi, and product authentication APIs to build more comprehensive applications. No other blockchain provides such a resource.

- **Instant Access to Nucleus Platform's User Base:** Developers launching dApps on Cobe's blockchain will have instant access to the large network of users on the Nucleus platform, enabling them to start scaling immediately. No other blockchain provides such direct access to a network of potential users of cross-border trade applications, giving Cobe a distinct adoption advantage in this space over alternative blockchains.

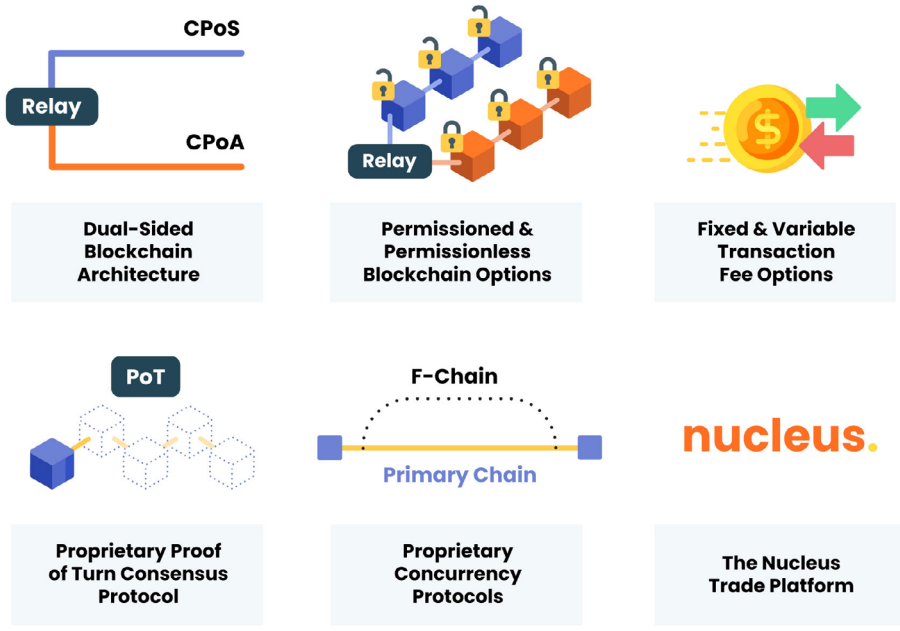
To ensure all its technologies are built on a foundation of scientific rigor, Cobe has collaborated with some of the world's leading academic institutions for its R&D, including University College London, Brunel University, Ca Foscari University of Venice, and Cagliari University.

Cobe's diverse team includes some of the world's leading academics in the field of blockchain technology, highly talented software engineers, experts in cross-border trade, and experienced entrepreneurs with proven track records.

Cobe will completely transform the way the 28-trillion dollar cross-border trade sector operates. Using distributed ledger technology, Cobe will improve transparency and efficiency, while also lowering the cost.

This means, with Cobe breaking barriers, millions of small businesses around the world will finally get the break they deserve.

Key Innovations



Cobe's Video Library

Cobe in a Nutshell

Blockchain Solution

Nucleus: Cross-Border Trade

Nucleus: DeFi & CeFi

Nucleus: Product Authentication

Tokenomics

State of the Industry: Cross-Border Trade

As the world becomes more connected, international trade between SMEs continues to grow – and with it, the challenges facing both buyers and sellers. These challenges fall into three categories:

1. Cross-border payments
2. Finance
3. Product authentication

1. Cross-Border Payments

Small businesses tend to conduct international trade using one of three methods [1]:

1. **Payment in Advance:** The buyer makes an advance payment and trusts the seller to send the goods as specified.
2. **Open Account Trading:** The seller ships the goods to the buyer with the hope of payment on delivery.
3. **Letter of Credit (LC):** The buyer's bank guarantees to make payment to the seller once presented with the stipulated documents.

A Letter of Credit (LC), issued by the buyer's bank, is a guarantee that payment will be made to the seller once the necessary documents have been presented, including proof of shipping (Bill of Lading), Certificate of Origin (CO), and Certificate of Inspection (CI).

LCs are used in international trade for the following reasons:

- **Security for the Seller:** Once the LC's terms are met, the seller is guaranteed to receive payment from a trusted third-party institution – the buyer's bank – regardless of the buyer's intent or financial situation.

- **Security for the Buyer:** The buyer's risk is greatly reduced when compared to making upfront payments, as funds are not released until the seller meets the LC's terms.

In summary, a LC provides both the buyer and seller with greater assurance that

the other party will meet their obligations. But despite the security LCs provide, they can still pose several challenges for smaller businesses [2]:

- **Availability:** Occupying a specialist area of banking means that LCs aren't readily available for most small businesses [3].

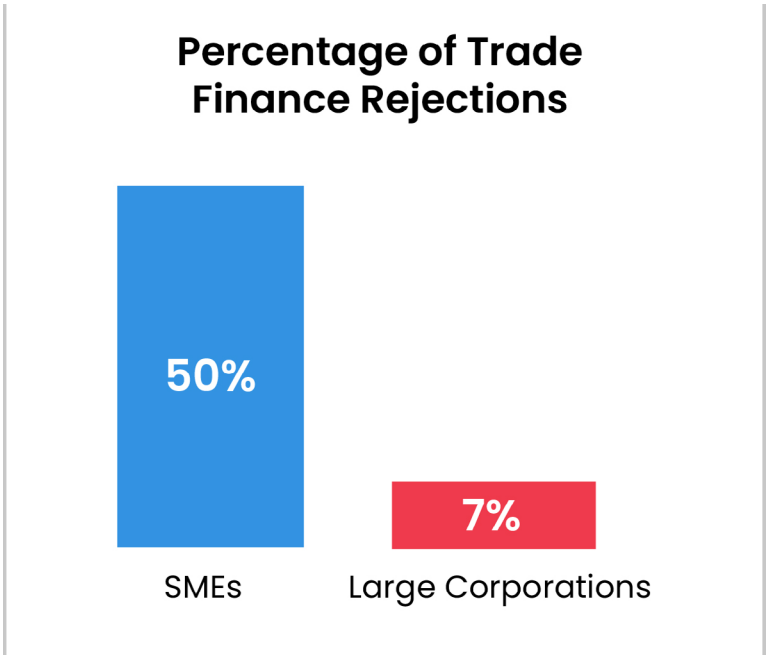
- **High Cost:** The level of risk and work involved means that LCs typically cost between 0.75% to 3% of the total value of the transaction [4]. This, in combination with the minimum set-up charges, means that the fee will usually exceed $2,000 to $3,000 [5] regardless of the transaction value. This becomes a problem for businesses looking to conduct smaller transactions as the LC cost equates to a significant percentage of the total value of goods.

- **Execution Time:** An LC can take weeks or months to set-up, greatly hindering the rate at which international trade can be performed and making it an impractical option for smaller businesses that cannot afford delays.

- **Fraud:** LCs are complex, making it easier for both buyers and sellers to forge and present false documentation respectively – increasing the level of risk when trading.

2. Finance

By 2026, the international trade finance sector will have an estimated value of 10 trillion dollars [6]. Despite this, SMEs still struggle to obtain trade finance from traditional financial institutions – with more than 50% of SME trade finance requests being rejected as opposed to just 7% for larger corporations [7].



According to the IFC, around 50% of formal SMEs have no access to funding [8] and rely solely on internal funds or money from friends and family for support. On top of this, approximately 40% of SMEs in developing countries have unmet financing needs [8], with the gap becoming even larger when micro and informal organizations are considered.

This lack of access to funding creates a vicious cycle for small manufacturers, where their small size makes buyers hesitant to provide them with an upfront deposit.

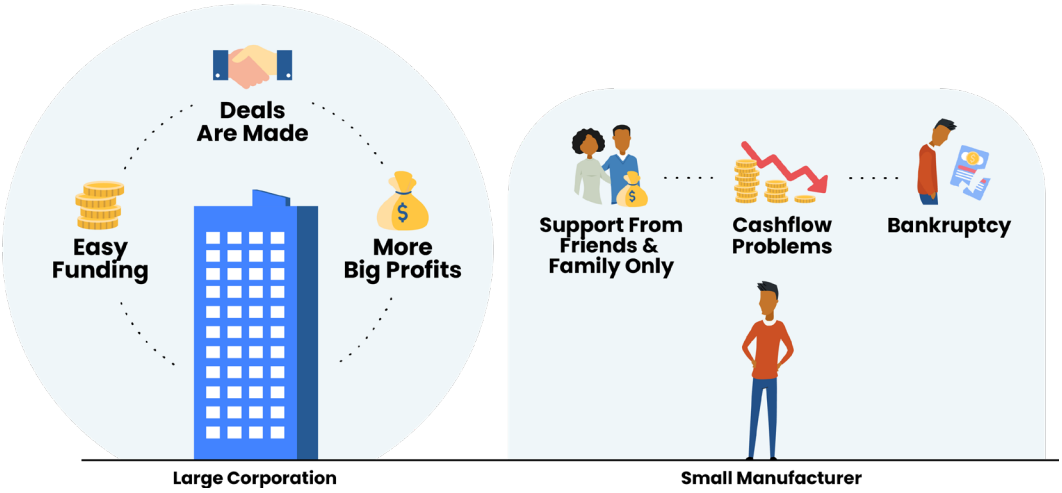
The lack of trust is only enhanced when manufacturers are in developing countries with an inefficient legal infrastructure, meaning that financial institutions either leave them to fend for themselves or simply cease trading.

This financing model, which relies heavily on centralized financial institutions, has resulted in a significant proportion of small manufacturers being excluded from the global economy – especially those in developing countries.

Solving this trade finance problem would achieve the following:

- **Opportunities for all:** Small manufacturers, particularly those in developing countries, would play a more active part in the global economy – benefiting not only manufacturers but their communities as well through job, wealth, and taxable income creation.

- **Greater choice:** Buyers will have a wider selection of manufacturers to trade with, offering more opportunities to compete, add value, and give customers greater value for their money.



Despite traditional centralized financial institutions being unable to solve these challenges, there is still no decentralized finance solution available. Though the DeFi sector has seen explosive growth with the rise of platforms such as MakerDao, Aave, Compound, and Syntheix, none of these platforms meets the needs of businesses seeking trade finance.

3. Authentication of Goods

Authentication of goods is a major problem, especially when dealing with smaller manufacturers located in places with inefficient regulation and legal infrastructure.

By making inaccurate claims, manufacturers can dramatically increase their profits at the expense of the consumer and honest competitors. For example, falsely claiming that a product is Fairtrade, organic, or gluten free is a common occurrence, often with few repercussions for the manufacturer.

Below are just some of the statistics that highlight the problem:

- In 2016, the losses due to counterfeit goods were estimated to be $98 billion in the USA, £13.6 billion in the UK, and $838 million in Singapore [9].

- At the end of 2020, global counterfeit losses were estimated to be around $1.82 trillion – with the losses continuing to grow [10].

- The global counterfeit pharmaceutical drug market alone was worth $200 billion in 2019 [11], growing at twice the rate of the legitimate pharmaceutical market.

- Significantly more organic food is claimed to be consumed each year than is actually produced [12].

- At least half of the extra virgin olive oil found on US store shelves has packaging with misleading claims [13].

- One in ten medical products in developing countries is falsified or substandard [14].

- A recent survey has shown that 54% of consumers want as much detail as possible on their goods due to a growing distrust in the claims made by manufacturers [15].

When it comes to authentication of goods, there is no one single measure that covers this in its entirety. Instead, several factors need to be considered [16].

Certifications: Certification is the primary method used to validate the claims made by manufacturers. This includes certificates of origin, crop certifications (fair trade, organic), phytosanitary certificates, conformity assessment certificates, conflict-free designations, ISO certifications and others. At present, most certificates are held by manufacturers in paper and electronic format. As document forgery can be performed with relative ease, this makes the process vulnerable to fraud. Blockchain technology can solve this problem by enabling the storage of these documents on an immutable ledger that is readily accessible.

Tracing & Provenance: At present, there is no simple method to track the authenticity of a product throughout its entire supply chain. Numerous centralized systems that utilize barcodes, electronic product codes (EPC), and RFID technology have been developed [17]. However, these systems rely on centralized databases and are vulnerable to hacking and insider fraud.
There are several emerging decentralized applications that enable product tracking back to origin. These dApps allow the user to scan the QR code on a product to validate its authenticity and trace it back to its origin.

Provenance takes authentication to another level. It not only traces products back to their origin but also provides data on their entire journey through the supply chain [18]. A product's location history, environmental conditions during the journey, custody history, and accelerometer information for damage assessment can all be effectively tracked and stored on an immutable blockchain ledger.

Internet of Things (IoT) devices are typically used to collect provenance data. This includes devices to track temperature, GPS coordinates, and custody ID and to provide accelerometer information. These devices send out data streams that are synthesized by provenance algorithms and then stored on to the associated blockchain's ledger. Although such technologies are now beginning to reach fruition, adoption is still minimal, particularly among SMEs.

Know Your Customer (KYC): KYC plays a critical role in cross-border trade. Effective KYC is vital for reducing fraud and money laundering. However, it can be a real challenge when dealing with trading partners located in developing nations and unfamiliar jurisdictions. The problem is further exacerbated by the ease with which documents can be forged and the lack of accountability in many regions of the world.
By storing data for each party on an immutable ledger, blockchain technology can dramatically improve KYC procedures for cross-border transactions. Blockchain based systems can not only ease the process of conducting KYC but also greatly enhance the levels of transparency and accountability. But despite its huge potential, over 99% of businesses perform KYC manually in a centralized manner – exposing themselves to significant levels of risk.

Track Record: The stronger a potential trading partner's track record, the more likely they will be able to meet their obligations. However, assessing the track record of a trading partner for cross-border trade can be difficult – particularly for SMEs who don't have the means to conduct extensive due diligence, such as visiting the manufacturing location, employing third party law firms, or speaking to consultants who understand the relevant jurisdiction. In addition, online track records, such as reviews, can be easily forged.

Again, blockchain is perfectly positioned to solve this problem by authenticating and storing the facts associated with each transaction on an unalterable distributed ledger. This data can then be used to validate the performance and track record of each participant, facilitating greater trust and collaboration.

No Suitable Blockchain Solution Available for Cross-Border Trade

When it comes to building cross-border trade applications, permissionless chains are better for generating transparency and lowering entry barriers to get the most participation, while permissioned chains retain the most confidentiality.

On top of this, some cross-border trade applications are best built on a blockchain with fixed transaction fees so that businesses can better predict their costs. Picture a product authentication application that's integrated into a business supply chain, processing a high volume of daily microtransactions. If the blockchain's transaction fees fluctuate by even a small amount, the business's day-to-day costs could change substantially. Naturally, most businesses would be uncomfortable with such uncertainty – making fixed transaction fees an essential prerequisite for adoption of such an application.

Feature	Use Cases
Permissioned Chain	Required when high levels of confidentiality are a prerequisite. For example, government or supply chain applications where transaction details should only be disclosed to those authorized.
Permissionless Chain	Where low barriers to entry for higher participation and transparency are high priority.
Fixed Transaction Fees	Required when certainty in cost is a prerequisite. For example, product authentication applications that are integrated into businesses' supply chains. Most businesses in this situation would prefer fixed fees over those that fluctuate on a day-to-day basis leading to uncertainty.
Variable Transaction Fees	Preferred when retaining a high level of decentralization is a top priority of the network. Transaction fees in this instance are determined by demand on the network rather than being fixed manually.

The table below provides a few examples of different cross-border trade application use cases where a permissioned, permissionless, or hybrid blockchain is more likely to be the preferred option. Note that this list is not exhaustive, but it serves to provide the reader with a few practical examples.

Permissionless Blockchain Use Cases	Permissioned Blockchain Use Cases	Hybrid Blockchain Use Cases
Decentralized Trade Finance (Defi)	Supply Chain Applications	Cross-Border Transaction Applications
NGOs	Logistics Applications	Product Authentication Applications
Charities & Donations	Digital Identity and Document Verification Applications	Provenance Applications
Fair Trade Applications	Banks & Financial Institutions	Institutional Bodies
Open-Source Applications	Pharmaceutical and Healthcare Applications.	Oracles

Below is a summary of the main blockchains that are currently available to decentralized cross-border trade application developers:

Blockchain	Type	Transaction Cost (Fixed/ Variable)	Primary Focus on Cross-Border Trade	Cross-Border Trade API's Provided by Blockchain
Ethereum	Permissionless	Variable	No	No
Cardano	Permissionless	Variable	No	No
Solana	Permissionless	Variable	No	No
Elrond	Permissionless	Variable	No	No
Algorand	Permissionless	Variable	No	No
Vechain	Permissionless	Variable	No	No
Stellar	Permissionless	Variable	No	No
Eosio	Permissionless	No Fee	No	No
R3 Corda	Permissionless	Fixed	No	No
Cobe	Permissioned, Permissionless & Hybrid Options	Fixed & Variable Options Available	Yes	Yes

As you can see in the above table, no blockchain (besides Cobe) offers the complete set of features that are essential for creating a comprehensive cross-border trade ecosystem, which are as follows:

- **Total Flexibility Between Permissioned & Permissionless Blockchain Options:** To create an effective cross-border trade ecosystem, dApp developers need a facility that allows them to build parts of their application on a permissioned chain and others on a permissionless chain. For example, a product authentication dApp may require certain transactions to be permissioned to retain confidentiality, while other transactions need to be permissionless for maximum transparency.

- **Total Flexibility Between Fixed and Variable Transaction Fee Options:** Despite it being an essential requirement for a blockchain solution that caters to the needs of all types of cross-border trade applications, this is unavailable at present.

- **Cross-Border Trade APIs:** These can be of huge help to developers looking to create effective cross-border trade applications. These include smart escrow, decentralized finance, product authentication and provenance APIs.

At present, no blockchain provides a robust set of cross-border trade APIs to its community.

Summary of State of the Industry

Right now, there is no comprehensive decentralized cross-border trade ecosystem that effectively addresses the needs of both buyers and sellers when trading across borders.

Numerous blockchain technologies have been (or are being) developed in relation to smart contracts, securing payments, decentralizing finance, product authentication, and streamlining supply chains. However, these blockchain solutions and dApps are fragmented rather than being integrated into a cohesive ecosystem. By changing this, Cobe aims to dramatically improve the ability of businesses, even those situated in the most underdeveloped regions of the world, to conduct international trade with greater security and ease.

Problems Definition

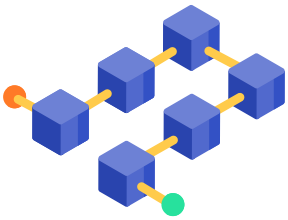
1. The Ideal Blockchain Solution for a Cross-Border Trade Ecosystem

For a cross-border trade ecosystem to function effectively, it must be built on a robust foundation, formed through a blockchain solution that includes the following features

Both Permissioned & Permissionless Chains: DApp developers need both blockchain options working in synergy.

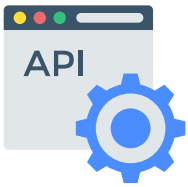
Fixed & Variable Transaction Fee Options: It is essential that developers have the flexibility to choose between these two transaction fee options.

Cross-Border Trade APIs: Rather than having to build everything from the ground up, developers should be provided with APIs that facilitate the development of their applications. These include smart escrow, track & trace, document authentication, provenance, and analytics APIs.



Both Permissioned & Permissionless Chains

Fixed & Variable Transaction Fee Options



Cross-Border Trade APIs

2. Cross-Border Transactions

Security for both parties: Though LCs are the primary method of securing financial transactions in cross-border trade, their complexity makes it easier for fraudulent buyers and sellers to slip through the net. Using blockchain technology, Cobe will simplify the process of securing payments for both buyers and sellers without the need of a centralized third party.

Speed of execution: LCs can take months to set up, often making them impractical for small businesses. Cobe will speed the process up by turning these months into minutes.

Low costs: No matter the transaction value, the minimum cost of LCs is over $1500. Cobe will cut this to less than $100 per transaction.

Transact in cryptocurrency or fiat: LCs can only be set up in fiat, while Cobe allows users to transact in both cryptocurrency and fiat.

Automate Know Your Customer (KYC): Cobe will automate KYC processes, reducing cost, time, and the possibility of fraud.

	Letter of Credit (LC)	Cobe
Transaction Cost	>$2,000	<$100
Execution Speed	> 4 Weeks	< 30 Minutes
Transaction Currency	Fiat	Cryptocurrency or Fiat
KYC	Manual	Automated
Fraud Risk	High	Low

3. Decentralized Trade Finance

When it comes to trade finance, there is currently no effective decentralized solution available, especially for integrating it with cross-border transactions and authentication of goods.
Cobe aims to solve this problem through a unique set of decentralized finance (DeFi) and centralized finance (CeFi) solutions that are designed specifically for purchasing goods across borders.

Cobe will help SMEs struggling under current centralized financial infrastructure by making trade finance cheaper, faster, and more accessible around the world.

	Traditional Finance	Cobe
Structure	Centralized	Decentralized
Lending Terms	Rigid	Flexible
Execution Time	Weeks	Minutes
Location	Regional Lenders	Global
Availability	Uncertain	Predictable

4. Product Authentication

When dealing with businesses that are small or located in underdeveloped nations, product authentication can be a real challenge. Cobe will change this by building a comprehensive, transparent, and easy-to-use product authentication platform.

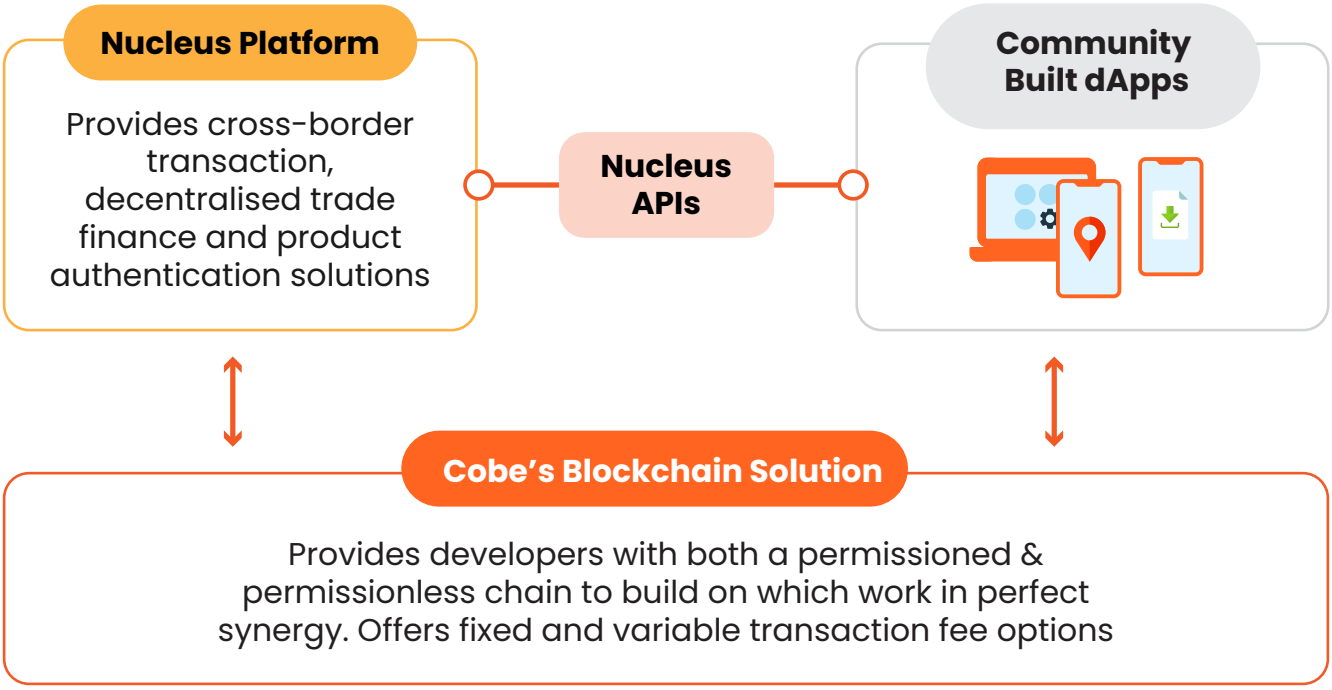
	Current State	Cobe
Authentication Process	Fragmented	Integrated
Counterfeit Goods	Prevalent	Very Difficult
Certifications	Difficult to Validate	Easy to Validate
Product Tracing	Manual & Complex	Automatable & Transparent
Buyer & Seller Track Records	Difficult to Validate	Transparent

Cobe's Solution

Cobe aims to make cross-border trade safer, faster, easier, and more cost effective by creating the most comprehensive decentralized cross-border trade ecosystem to date.

Cobe's Blockchain Solution: This includes a game-changing dual-sided blockchain architecture, a novel consensus protocol coined Proof of Turn (PoT), and cutting-edge concurrency protocols. Cobe's blockchain solution includes a permissioned and permissionless chain that work in perfect synergy as well as the flexibility to choose between fixed and variable transaction fees. See page 55 to learn more about Cobe's blockchain solution.

Cobe's Native Platform (Nucleus): This will be launched on Cobe's native blockchain, with the objective of tackling the key challenges buyers and manufactures face when conducting cross-border trade. As well as dealing directly with the critical challenges that the sector faces, Cobe's Nucleus platform will come with a comprehensive suite of cross-border trade APIs that dApp developers can utilize when creating applications on Cobe's blockchain.



Nucleus Platform

Cobe's native platform, called Nucleus, will enable users to navigate the three biggest challenges faced when trading across borders:

- Cross-border transactions
- Financing
- Product authentication

Nucleus Platform: Cross-Border Transactions

Small businesses have serious concerns when making transactions across borders. For buyers, it's trusting that they'll receive their goods upon payment, while for sellers, it's hoping that they'll receive payment.

Nucleus will address these issues through the following features:

Sales Contracts: In international trade, sales contracts define the roles and responsibilities of both the buyer and the seller. This includes the price, description of goods, payment terms, method of transportation, pre- and post-shipment inspection requirements, warranties, Incoterms rules, and the documents that need to be presented by the seller.

Nucleus will enable buyers and sellers to create sales contracts with ease. These are then stored on Cobe's secure blockchain, through smart contracts, once both parties have signed off.

The transaction's progress can then be tracked and updated as required milestones are reached. This includes the storage of documentation associated with the trade, such as the Certificates of Origin, Bill of Lading, and Inspection Certificates.

Escrow Smart Contracts: Once the buyer and seller agree on the terms of their sales contract, they will have the option to secure their transaction through Nucleus's smart escrow feature.

Nucleus will allow the buyer to transfer funds into Cobe's escrow facility, where they will be held securely. As per the terms agreed to in the sales contract, the buyer will then be able to choose what percentage of the transaction to pay the seller upfront, upon shipment, and upon receipt of the goods.

Holding the funds in a secure smart escrow contract will ensure that both parties meet their obligations as defined in their sales contract, as funds will not be released to the seller if they don't act in accordance with it. Similarly, the buyer will be obliged to pay the seller from the funds that are held in escrow once the seller meets their obligations.

Cryptocurrency & Fiat Transactions: To provide the greatest level of flexibility, Nucleus will allow for transactions to be conducted in either fiat or cryptocurrency.

Price fluctuation is a key concern for sellers transacting in cryptocurrency, as they can be left in a vulnerable position if the value drops. Nucleus will overcome this problem by using its own stable coin. Turn to page 40 to learn more.

Know Your Customer (KYC) Automation: Before they can commence trading, each user will need to submit their KYC information on the platform – which will be stored on Cobe's immutable blockchain. The platform will have filters that request proof be provided for specific claims being made. For example, if a manufacturer claims to be ISO certified, proof must be provided before the platform displays the information. In essence, Nucleus's KYC automation processes will reduce fraud, increase accountability, and improve performance.

Track Record: As each user's trading history will be stored on Cobe's blockchain, they will be able to share this data with other users on the platform that they are considering trading with. The better a user's track record, the greater the confidence others will have in their ability to meet obligations.

Independent Expert Review Feature: Another aspect of Nucleus will be its independent review feature. Users will be able to reach out to experts who can assess the KYC information and documentation supplied by a trading partner, such as shipping documents, Certificate of Origin, or a Bill of Lading. This could be a legal expert, notary, or consultant specializing in a particular jurisdiction or area of trade.

All individuals who wish to provide a peer review service on the platform will need to register on it and undergo the necessary KYC. Upon assessing any documentation on behalf of the buyer and seller, the individual providing the review will need to provide their report on the platform – in exchange for which the buyer or seller would pay them an agreed fee. This unique feature would provide users with easy access to experts in their chosen niche, further reducing the possibility of fraud.

Nucleus Cross-Border Trade Platform Technology Stack

Layer	Features		
Presentation	User Dashboards, Web & Mobile interfaces		
Application/ Service	Frontend and Backend Apps, Smart Contracts (Languages: React, Node, Solidity, Go)		
Database	NoSQL (MongoDB), SQL		
Coins/Token	Cobe's Native Coin (CBE)	Cobe Stable Coin (CBS)	Approved Coins & Tokens for Collateral Deposits (CBR-1)
Blockchain	Cobe's Native Blockchain, Consensus (CPoS, CPoA)		
Infrastructure Layer	Network, Compute and Storage (Cloud Services: Amazon Web Services, Google Cloud, etc.)		

Cross-Border Transaction Architecture

Nucleus' cross-border payment mechanism will be fast, efficient, secure, and low-cost. Below is an outline of how this will be accomplished:

Fiat Cross-Border Transaction Architecture

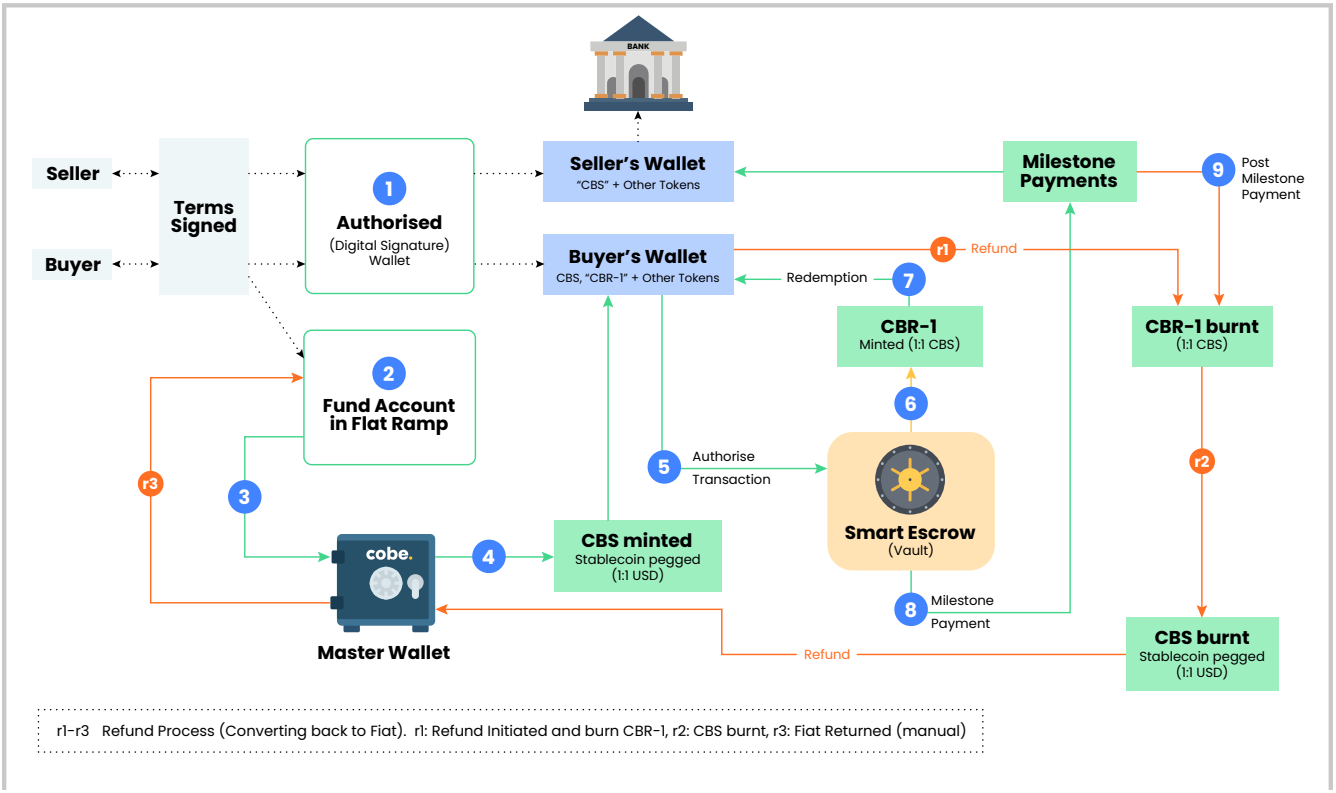


Figure: Fiat cross-border transaction architecture

Once the buyer and seller agree on the terms of their sales contract (terms signed), the fiat transaction mechanism works as follows:

Step 1: The buyer and seller are verified and authorized to proceed with the transaction.

Step 2: Funds are transferred by the buyer from their fiat bank account to Nucleus using a fiat gateway.

Step 3: Funds are transferred from the fiat gateway to Cobe's Fiat Master Wallet. Cobe's Master Wallet is an audited fiat account held with a licensed bank, which safely stores funds transferred from Nucleus's users to conduct transactions.

Step 4: As soon as the fiat funds reach Cobe's Master Wallet, an equivalent amount of Cobe stable coin (CBS) will be minted, pegged at a 1:1 ratio to USD.
The CBS minted is transferred to the buyer's wallet.

Step 5: Once the buyer authorizes, the stable coins (CBS) are transferred to Nucleus's Smart Escrow Vault on behalf of the buyer to pay the seller as per the terms of the sales contract.

Step 6: As CBR-1 (Cobe's Redemption Token) is pegged at a 1:1 ratio with CBS, the equivalent amount of CBR-1 is minted to the amount of CBS which the buyer has transferred to Nucleus's Smart Escrow Vault.

Step 7: This newly minted CBR-1 is transferred to the buyer's wallet.

Step 8: The buyer releases tranche (milestone) payments to the seller as the seller fulfils their obligations.

Step 9: When funds are released from the smart escrow to the seller, the equivalent amount of redemption tokens (CBR-1) in the buyer's account are burned.

Alternatively, if the funds are refunded to the buyer, the stable coins are transferred back to the buyer and the equivalent amount of redemption tokens are burned.

Once the transaction has been completed, the seller (or the buyer in the case of a refund) has the option to convert their stable coins back to fiat and have the funds transferred to their fiat bank account.

Once a user converts their stable coins to fiat, the stable coins associated with the transaction are burned.

This mechanism of minting and burning CBS in line with the amount of USD held on the Nucleus platform will ensure that it always remains adequately collateralized at a 1:1 ratio with USD, making it resistant to price fluctuations.

Refund Process: In the case of a refund being issued to the buyer, the process shown in orange in the figure above is initiated. This includes:

R1: The refund process is initiated. Once the CBS is refunded to the buyer, the equivalent amount of CBR-1 in the buyer's wallet is burned.

R2: Once the buyer requests their refunded CBS to be converted back to fiat, the concerned CBS is burned.

R3: The equivalent amount of fiat (USD) to the amount of CBS burned is transferred from Cobe's Master Wallet to the buyer's bank account via the fiat ramp.

Cryptocurrency Cross-Border Transaction Architecture

Performing a cross-border trade transaction using a cryptocurrency has a similar process to that detailed above but is simpler as it does not include the minting of CBS and does not involve CBR.

The figure below describes this process:

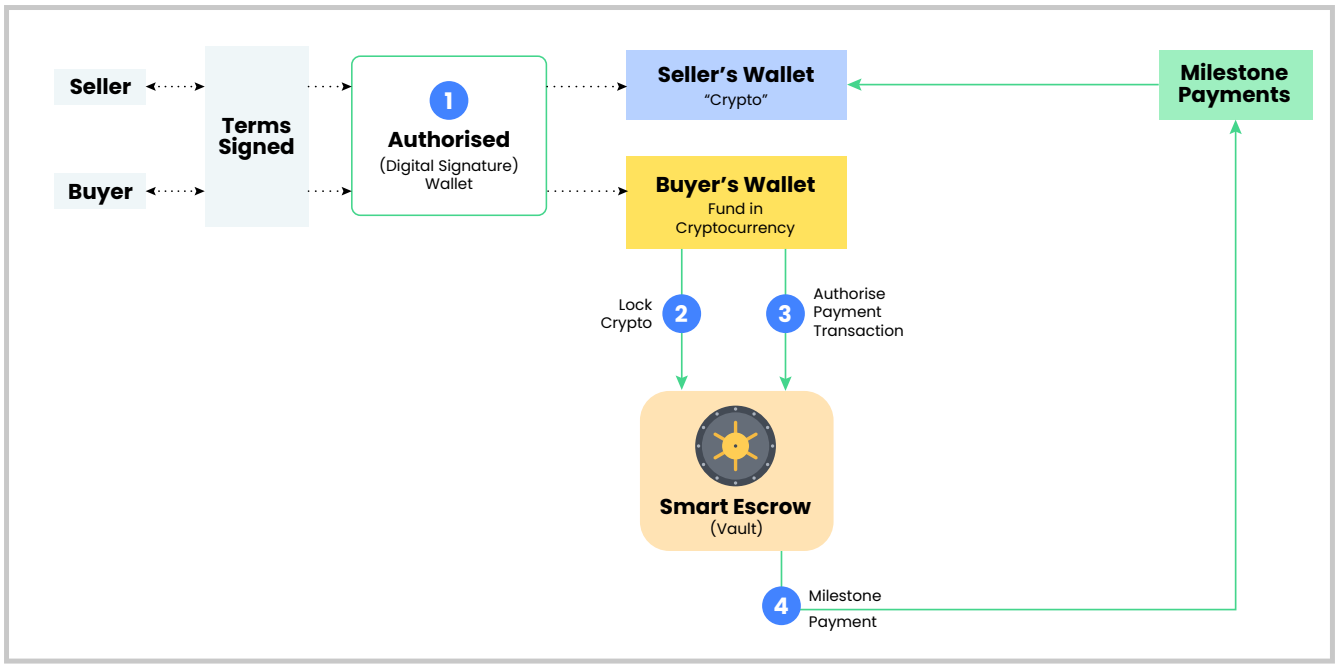


Figure: Crypto cross-border transaction architecture

Nucleus Platform: Decentralized Trade Finance (DeFi) Solution

The lack of decentralized finance (DeFi) solutions for the cross-border trade sector means that it remains unsupported. Cobe's Nucleus platform will address this problem by creating the most comprehensive trade DeFi solution to date.

The key features of Nucleus's DeFi solution are as follows:

1. Cryptocurrency Backed Trade Finance (DeFi)

Loan applications usually take weeks to process with traditional trade finance. With Nucleus, both buyers and sellers will be provided with instant loans against cryptocurrency they place as collateral on the platform.

Though there is a strong demand for this type of lending, it's often questioned why loan applicants don't simply cash out their cryptocurrency and use the proceeds for trading – rather than taking out a loan.

Unlike traditional finance or regular cash, Nucleus's DeFi solution offers the following benefits:

- **Faster Execution:** When being issued with trade finance from traditional centralized lenders, SMEs are expected to submit assets, such as property, as collateral – which takes time and money to value. It's much faster and easier to implement cryptocurrency as a source of collateral.

- **Lower Costs:** The amount of work required from the lender to issue a traditional trade finance loan makes it costly. Nucleus's automated algorithmic protocols bypass this and bring down the price of application processing – resulting in cheaper borrowing rates.

- **Retained Portfolio Gains:** Cryptocurrency is usually held onto as a form of investment, so buyers and sellers who cash out run the risk of missing potential gains.

- **Income Tax Deferment:** Income tax can be deferred by placing cryptocurrency as collateral, maintaining cash flow.

- **Track Record:** By taking out Defi loans and meeting their obligations, borrowers can build a strong track record on the Nucleus platform – resulting in favorable lending terms.

- **Cobe's Native Coin (CBE) as Collateral:** Nucleus offers lower net borrowing

costs to those who place its native coin as collateral, by charging a lower interest rate and loan processing fee. This will, in turn, benefit investors in CBE by increasing the demand for the coin.

2. Centralized Trade Finance (CeFi)

In addition to decentralized lending (DeFi), Nucleus will also facilitate lending for buyers and sellers from traditional trade finance lenders.

Acting as a marketplace, Nucleus will facilitate lending from traditional trade finance houses by allowing both borrowers and lenders to source relevant partners. This will involve leveraging trustable track records to validate the information required to approve loans and negotiate terms – which will then be finalized using smart contracts.

This form of lending can be highly beneficial in the following situations:

- **Lending Without Collateral:** Applicants unable to provide collateral will be able to obtain trade finance against other factors, such as proof of order, track record on the platform, or through allowing the lender to place a charge on the funds in their smart escrow.

- **Lending Against Alternative Assets, such as Property and the Seller's Inventory:** Cobe's immutable blockchain will help prevent fraud by making it easy for lenders to verify the information provided by a borrower and to limit multiple loans being taken out against the same asset.

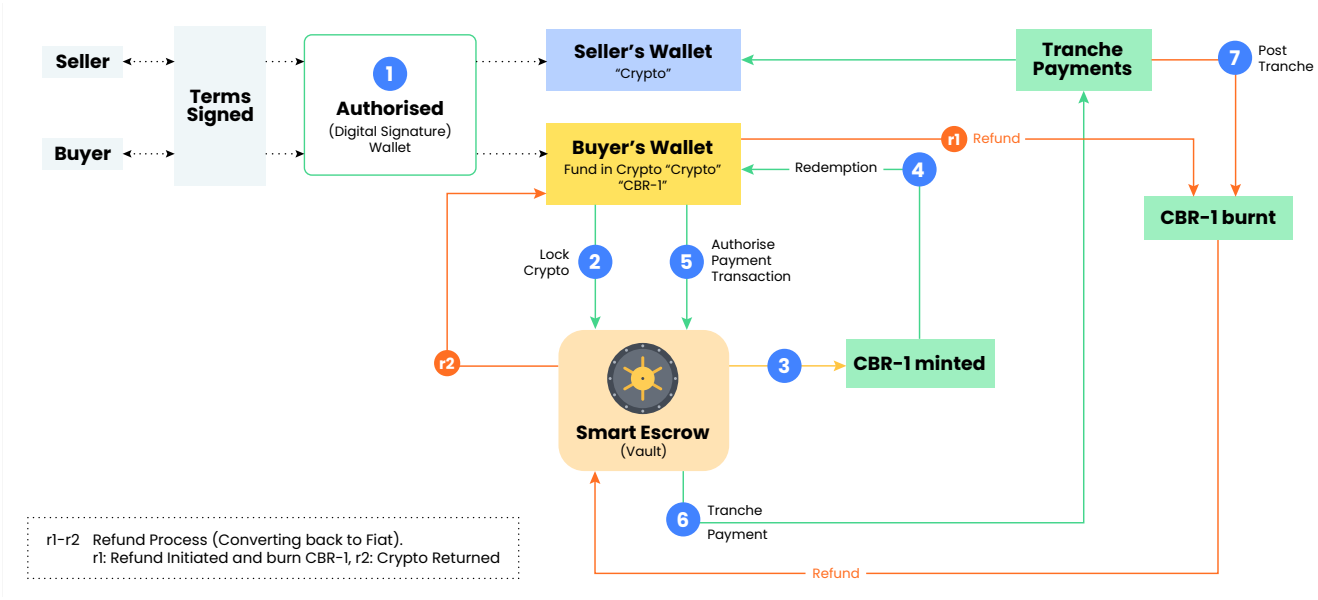


Figure: CeFi trade finance

Nucleus will charge a fee for each successful lending transaction, with users being

rewarded with lower fees if Cobe's native coin (CBE) is used to make payment. This will help increase both the adoption and value of CBE.

Differentiation From Other DeFi Platforms

Nucleus's lending platform differs from both traditional trade finance and other DeFi solutions because of the following unique features:

- **Integrated Platform Leading to Lower Borrowing Costs:** Nucleus can offer highly competitive rates to borrowers because it doesn't rely solely on lending for revenue. This, in turn, will result in increased adoption and revenue from other services, like the escrow smart contracts and product authentication.

- **Track Record Based Lending:** The more loan obligations are met and cross-border trades completed by a user, the better the borrowing rates Nucleus will offer them. This creates a win-win situation, as the more the platform is used to build track records, the greater its adoption.

- **Loans Tailored to Milestones:** Cross border transactions consist of three milestones: initial deposit, payment upon shipment of goods, and payment upon receipt. Nucleus's algorithms allow lending to synergize with the borrower's requirements and keep fees to a minimum. For example, funds will go directly toward loan repayment if released to the seller from the escrow account.

- **Lending Against Smart Escrow Funds (CeFi):** Cobe will allow sellers to borrow against the funds placed in the smart escrow contract by the buyer. This lending option will provide a huge number of smaller manufacturers with a funding method that doesn't rely on collateral or other asset-based funding. To prevent fraud, these loans will only be issued by experienced trade financiers registered on the platform – who will be given first charge on the buyer's escrow funds.

- **Trade Finance Marketplace (CeFi):** in addition to providing decentralized finance, Nucleus will act as a marketplace where professional lenders can interact with borrowers, and any loans agreed upon can be executed via smart contracts. This feature is important for more complex deals, such as those where adequate collateral is unavailable. Nucleus's CeFi marketplace will enable multiple lenders to jointly issue a loan to hedge the risk1.

- **Native Blockchain**: Most DeFi platforms, such as Compound, Aave and MakerDao, are built on a third party blockchains, such as Ethereum, Cardano or Solana. Nucleus's DeFi solution will be built on its own native blockchain, Cobe, enabling greater flexibility, autonomy, and growth potential for investors in its CBE coin.

Nucleus Platform's DeFi Platform Technology Stack

Layer	Features		
Presentation	User Dashboards, Web & Mobile Interfaces		
Aggregation	Data Consolidation (Market & Lending Data, etc.)		
Application / Service	Frontend and Backend Apps, Smart Contracts, dApps (Languages: React, Node, Solidity, Go)		
Database	NoSQL (MongoDB), SQL		
DeFi Protocols	Loans - Exchanges - Asset Management - Smart Escrow - Governance		
Coins/Token	Cobe's Native Coin (CBE)	Cobe Stable Coin (CBS)	Approved Coins & Tokens for Collateral Deposits (CBR-1)
Blockchain	Cobe's Native Blockchain, Consensus (CPoS, CPoA)		
Infrastructure	Network, Compute and Storage (Cloud Services Amazon Web Services, Google Cloud, etc.)		

Nucleus will introduce a decentralized finance protocol (DeFi) where users can borrow Cobe's stable coin (CBS) against other cryptocurrencies – placed as collateral in a dedicated vault.

DeFi Borrowing:

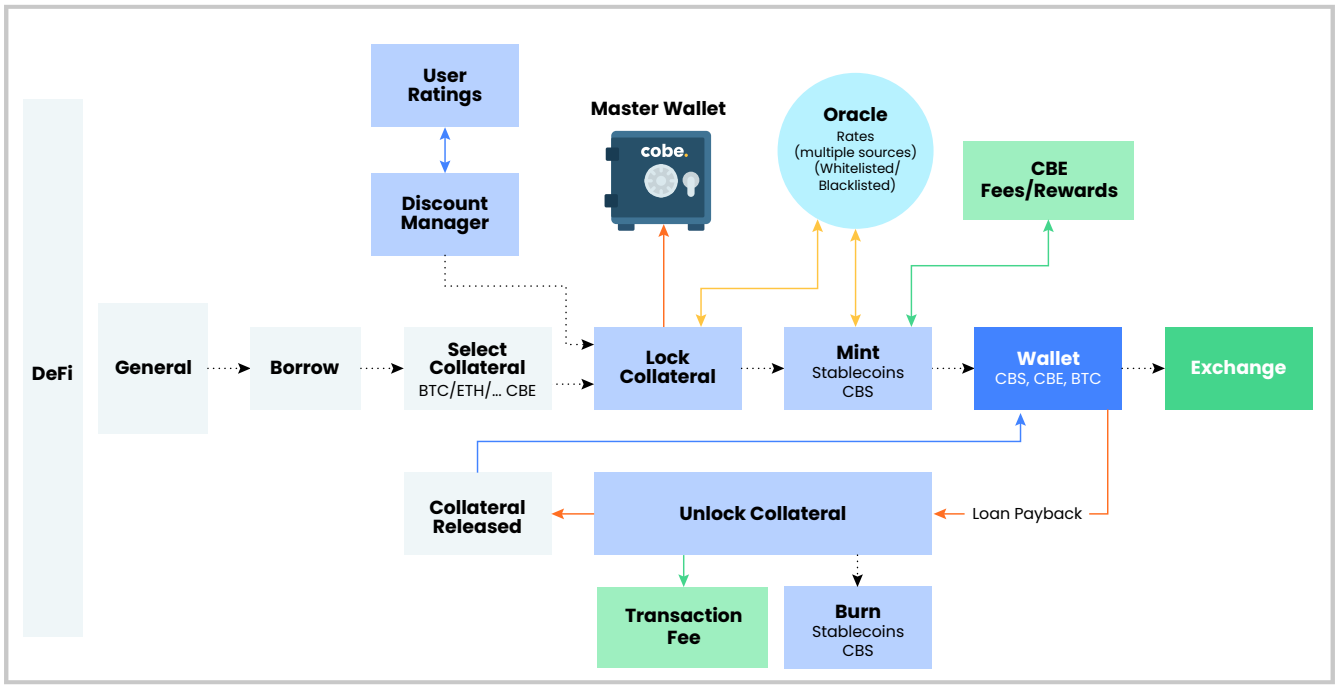


Figure: Schematic of borrowing process

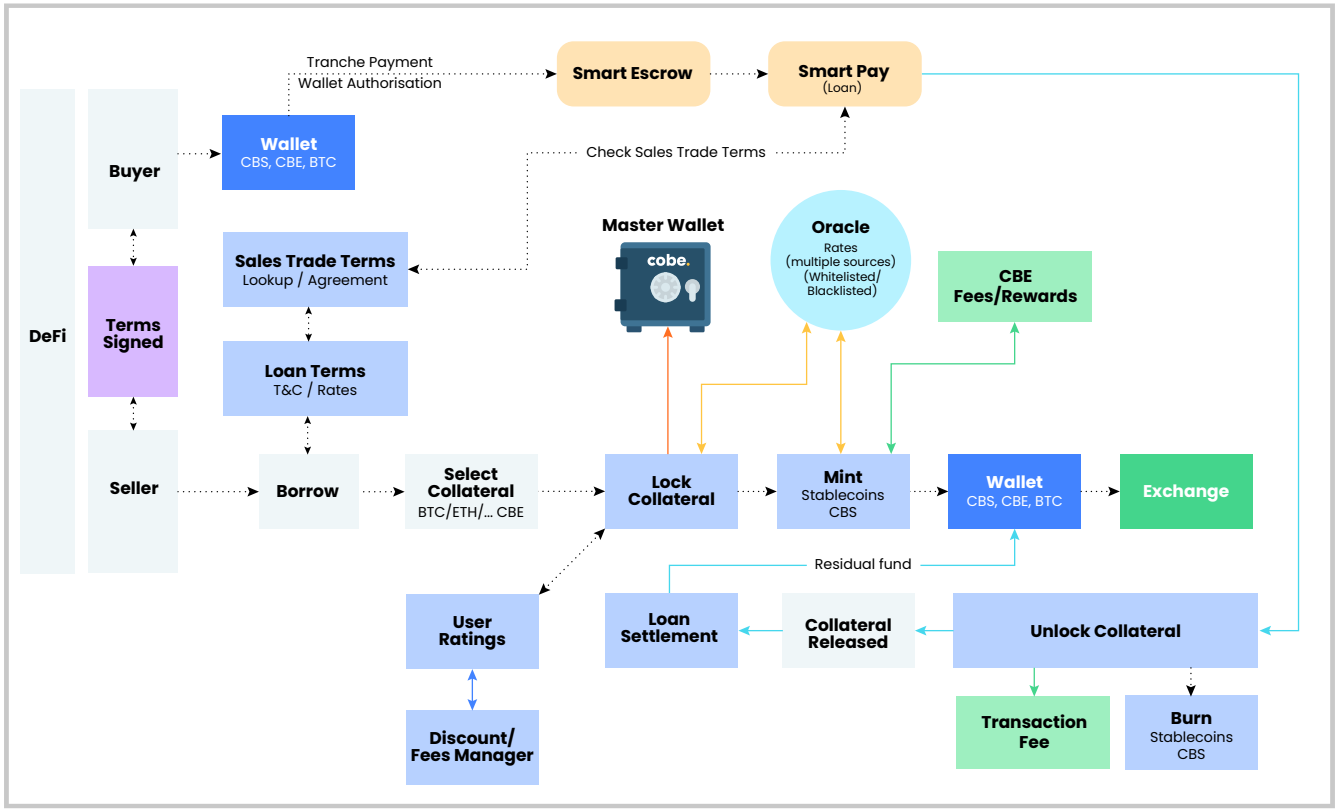


Figure: Seller milestone based borrowing

DeFi Lending: Minting New Cobe Stable Coins

Whenever cryptocurrency is placed as collateral in a dedicated vault, new Cobe stable coins (CBS) that are backed by the borrower's collateral and pegged to the USD will be minted.

The amount of stable coin generated will be proportional to the Loan to Value (LTV) ratio. For example, if a currency has an LTV ratio of 50%, then the number of stable coins minted will be equivalent to 50% of the value of the asset (USD) being placed as collateral.

This can be expressed as:

New Cobe Stable Coins (CBS) Minted = LTV Ratio x Market Price of Collateral Currency (in USD) x Amount of Collateral Currency

As soon as a user returns their borrowed stable coins and their collateral has been transferred back to them, the stable coins associated with the transaction will be burned. This will ensure that Cobe's stable coins always remain adequately collateralized against USD, retaining their stability.

Benefits of Borrowing Via Cobe's Stable Coin (CBS)

Medium of Exchange: The price stability in USD terms of Cobe's stable coin (CBS) means that it functions reliably as a medium of exchange, being easily exchangeable for USD and allowing users to supplement their fiat cash flows without having to sell their crypto assets.

Transaction Speed & Transparency: Cross-border transactions conducted through traditional banking tend to be costly, lack transparency, and take days to process.
However, with CBS, such transactions can be completed almost instantly for minimal fees.

Loan Terms

Unlike traditional banking and trade finance, Nucleus's DeFi solution will allow users to borrow funds instantly without the need for negotiation or approval by a centralized third party.

Indefinite Lending Period: Given that the lending is provided by Nucleus against cryptocurrency collateral, provided the borrower's collateral remains above the required threshold, there will be no maturation date for their loan. This will provide borrowers with the greatest flexibility to manage their cash flows without the need to sell assets.

Lending Tailored to Milestones: Borrowers will be able to tailor their lending to their cross-border transaction milestones.

For example, if a sales contract was established between a buyer and seller where the latter is paid 50% of the funds upon shipping and the remainder upon delivery, then the borrowing can be synced. Meaning, as soon as funds are released from the smart escrow, the borrowing is reduced by an equivalent amount.

Tailoring loans to transaction milestones minimizes the duration that a user borrows funds for, ensuring that they pay interest for the shortest time possible. In addition, it reduces the management effort required by the user to maintain their lending.

Interest Rates

Nucleus's DeFi platform will provide users with highly competitive interest rates in the range 0.5–3% per annum, making it approximately 10 times more cost effective than traditional trade finance. Through cost-effective lending, Nucleus will facilitate trade and adoption of its ecosystem.
To further incentivize holistic growth of the platform, users will be offered progressively lower interest rates based on the following two components:

User's Personal Rating Score: Each user on the Nucleus platform will be given a user rating between 1 and 100, which will grow as they increase their activity and meet their obligations. The higher a user's rating, the greater the discount they will receive on their interest fee.

Using Cobe's Native Coin (CBE) as Collateral: Users will receive further discounts on their interest rate fee if they place CBE as collateral, increasing its demand and adoption.

However, to ensure a sufficiently diversified basket of crypto assets backing the stable coin (CBS), the discount will only be available on a maximum of 2.5% of Cobe's native coin (CBE) being locked as collateral. The discount will increase as the amount of CBE gets progressively closer to 2.5%.

The final interest rate can be expressed as follows:

$$I = I_{min} + \frac{I_{max} - I_{min}}{e^{\mu_c R} + x^c}$$

* I_{min} Minimum interest achievable by applying discount (I_{min} =0.5%)
* I_{max} Maximum interest (I_{max} =3%)
* R - User's platform rating (Range limit 0–100)

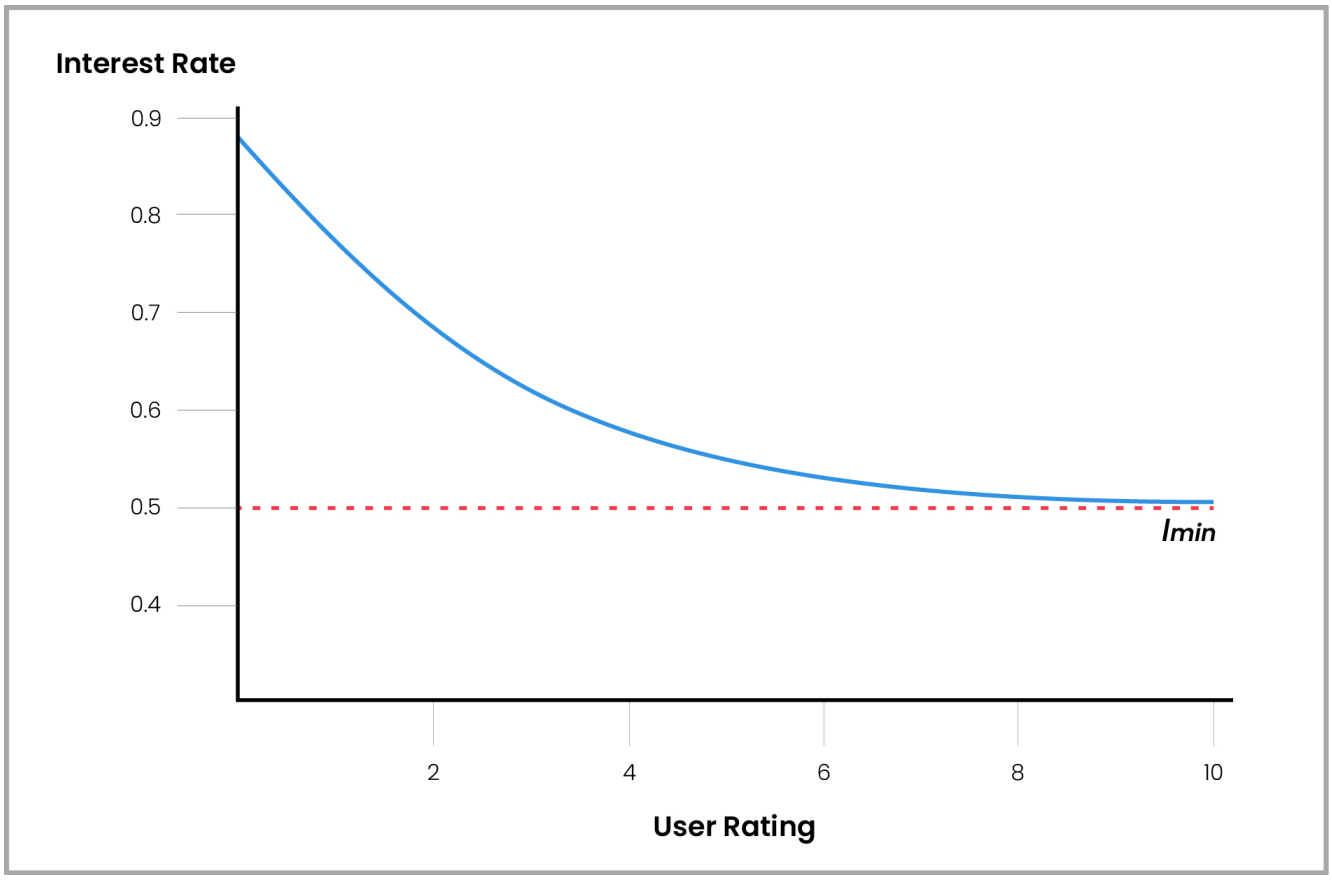
* μ_c - User rating coefficient (Range 0–1)

* χ- Cobe collateral coefficient (Range 0–1)

* C - Cobe native coin (CBE) collateral percentage (Range limit: 0–2.5%)

The user rating coefficient μ and the Cobe collateral coefficient x are the two primary parameters that will be used by the protocol to adjust how much a user's rating 'R' and the fraction of Cobe native coin (CBE) placed as collateral will impact the interest rate discount. For instance, if $\mu c > \chi$, the most important aspect in determining the discount will be the user's platform rating.

In the example below, we have set $\mu c = \chi = 0.5$ (user's rating and the usage of CBE as collateral are weighted equally) and C=1%. Imin is set to 0.5%. As the user's rating increases, the interest rate decreases toward the minimum value.



Collateral Loan to Value (LTV) Ratio

To ensure that loans are well collateralized, users will need to place a minimum collateral of 150% against the amount that they are looking to borrow.

The collateral amount required will also vary from currency to currency, with the required collateral being lower – i.e., closer to 150% – for less risky assets. Liquidations will automatically occur when the collateral value drops below the set LTV value for the associated asset.

Liquidation Penalty: If a loan is liquidated, the borrower will incur a liquidation penalty. This measure will incentivize users to remain adequately collateralized and minimize the number of liquidations.

Market Data: By connecting with reliable market data feeds that are selected via community votes (as explained in the next section), Nucleus's DeFi platform will be updated in real time with accurate data on the prices of assets that have been approved as a source of collateral.

LTV Ratio Risk Analysis

The risk associated with each crypto asset used as collateral will be calculated based on its liquidity and volatility. The liquidity of an asset is defined as the average of its volume traded in a given time duration, and an asset's volatility is defined as the standard deviation of its price over a set duration. Both the liquidity and volatility of an asset will be measured relative to other collaterals, and the total risk will be weighted as a sum of the two.

Therefore, the risk of an asset 'A' will be calculated by the weighted sum; weights being indicated by (ω) of its liquidity (λ_A) and volatility (δ_A) relative to the total liquidity and volatility of the other collaterals, using the following formula:

$$\Psi_A = \omega \frac{\delta_A}{\sum_i \delta_i} + (1 - \omega) \frac{\lambda_A}{\sum_i \lambda_i}$$

To maximize the accuracy of the formula, the weighted sum of both an asset's liquidity and volatility will be calculated using daily, weekly, and monthly data.

In addition, to account for strong shifts in market conditions, Nucleus's DeFi governance protocol will allow for both the liquidity and volatility weights to be adjusted through transparently designed processes. This will help minimize the number of forced liquidations in downturns and provide users with the best possible LTV ratios during periods of high growth.

Nucleus Platform: DeFi Governance

Nucleus's DeFi platform will have an independent governance protocol that will give a subset of users the ability to vote on the protocol's changes.

Voting Rights: Holders of Cobe's native coin (CBE) will be able to vote on all new changes that are put forward. The number of votes a voter can place will be proportional to the number of CBE coins they hold.

Governance Smart Contracts: To cast their vote, users will temporarily lock their CBE coins in a governance smart contract. They will then be able to vote to support or reject a proposal, and their vote will be weighted proportionally to the number of CBE staked in the governance contract.

Governance Structure

Nucleus's DeFi platform's governance protocol will be divided into four Stages

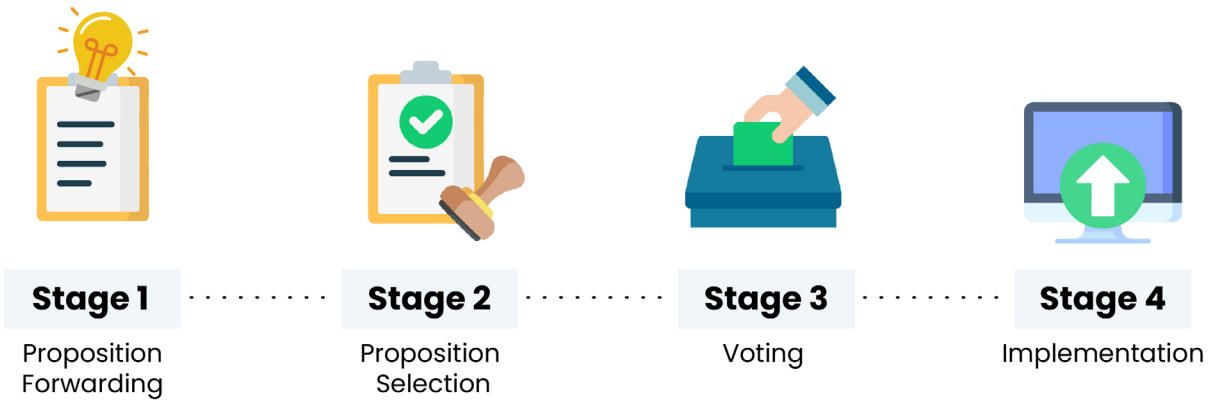
Stage 1 (Proposition Forwarding): Topics for voting on will be put forward for consideration at this stage, an opportunity available to all users and not just Nucleus's team or the developer community.

Stage 2 (Proposition Selection): Whether a vote will take place on a matter will be determined by the governance panel. The panel will consist of a minimum of 20 members made up from different communities, including members from the core team, developers, service users, and CBE coin holders. All new members will be added to the panel via community vote.

On top of this, regular surveys, polls, and other feedback channels will be put in place to help the panel to determine which topics will be put forward for voting.

Stage 3 (Voting): This will take place after a topic has officially been approved for voting. To maximize transparency, all voting results will be announced in a timely manner on Cobe's website.

Stage 4 (Implementation): All changes that require implementation will be executed as soon as possible, with a level of urgency being assigned to each change. This will depend on the level of criticality (e.g., critical factors that will affect the security of the platform), the resources required to implement the change, their complexity, other pending tasks, and the expectations of the community. The time frame in which each change will be implemented will be announced on Cobe's website.



DeFi Governance Parameters: These will include, but are not limited to:

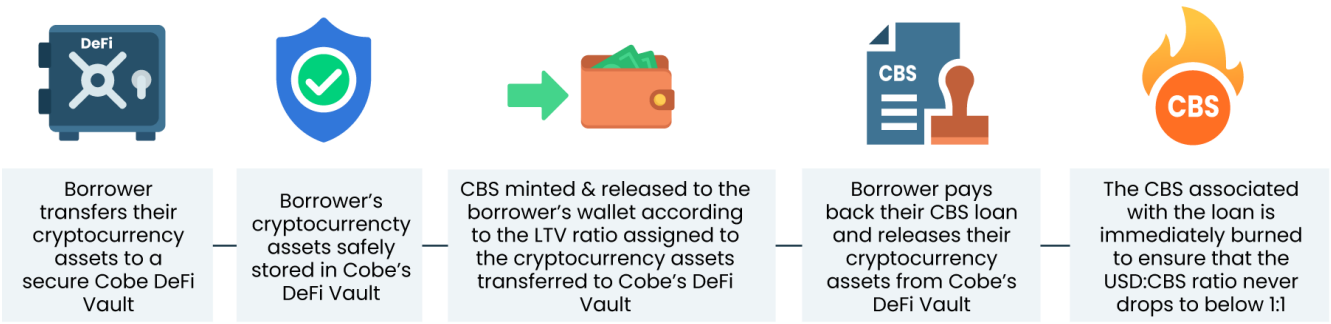
- System and protocol updates
- Approving new cryptocurrencies that can be used as collateral
- Adjusting the risk parameters associated with a currency, such as its LTV
- Market data feed selection
- Governance processes
- Emergency actions.

Cobe's Fully Collateralized Stable Coin (CBS)

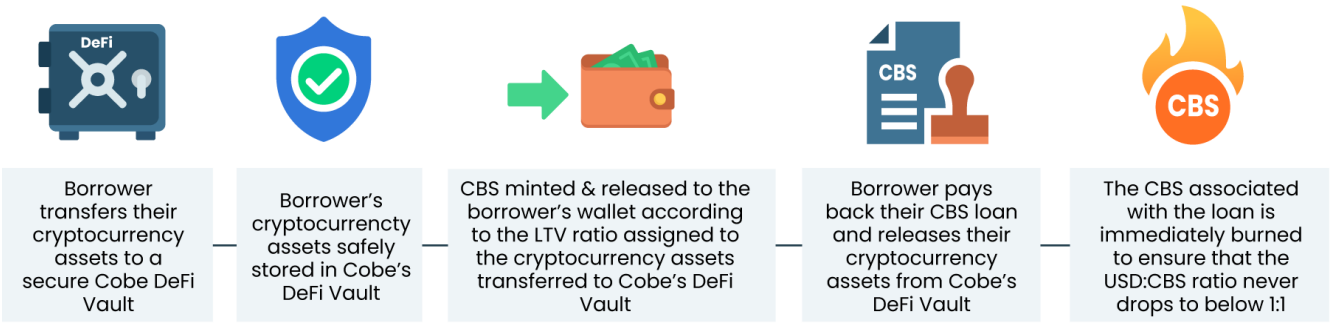
Cobe's stable coin (CBS) will be pegged at a ratio of 1:1 with the USD. Each CBS coin minted will always be backed by a minimum collateralization of one USD.

The collateral required to mint new stable coins will be generated via the following three mechanisms:

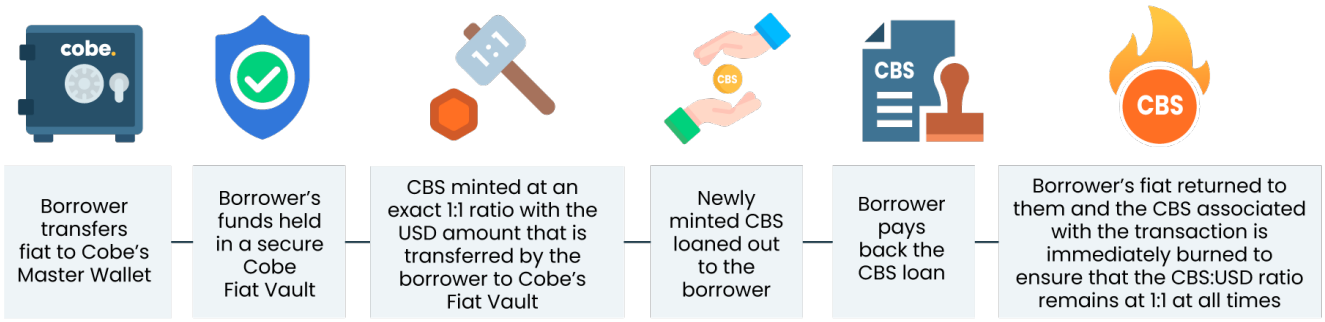
Collateral Placed in Nucleus's Smart Escrow Vault: As described on page 27, when a user places fiat or cryptocurrency into Cobe's Smart Escrow Vault to conduct a cross-border trade, an equivalent amount of CBS will be minted, pegged at a 1:1 ratio with the USD. Then, as soon as the user requests for their collateral held in a Smart Escrow Vault to be released, the equivalent amount of CBS that was minted will be burned – meaning that the amount of CBS will never exceed its USD collateral equivalent.



Collateral Placed in Nucleus's DeFi Vaults: Once collateral is placed in its secure DeFi Vaults, CBS will be minted as the currency Nucleus will issue its loans in. As discussed on page 35, this minting will be in line with the LTV ratios assigned to each cryptocurrency. At no point will the LTV collateral used to mint CBS fall below a ratio of 1:1 with the USD.



CBS Generated for General Purposes: In addition to stable coins being minted via the collateralization of assets placed in its Smart Escrow and DeFi vaults, Nucleus's lending platform will also include general purpose CBS minting vaults, where users can place their fiat and mint CBS at a 1:1 ratio with USD. In addition to providing users with a secure and reliable stable coin which they are then free to use, this facility will be an integral feature of Nucleus's CeFi services – allowing lenders to securely place their fiat in a CBS minting vault to mint CBS, which is then loaned out.



Randomized Independent CBS Audits

As part of its governance protocol, Cobe will ensure total transparency and confidence in CBS by commissioning certified independent auditors – who will audit the total amount of CBS in the entire ecosystem on a quarterly basis. This will ensure that CBS always remains at a minimum collateral ratio of 1:1 with the USD.

To make sure that the CBS audits are as rigorous as possible, the following measures will be taken:

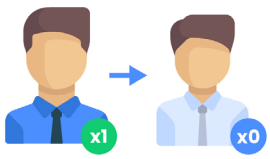
Voting on Auditor Selection: CBE holders will vote on which certified auditors will be commissioned to conduct the CBS audit. There will be a minimum of four separate auditors selected each year, one for each quarter.

No Consecutive Auditing: To ensure greater trust in the auditing process, no single auditor will conduct two CBS audits in a row.

Audits Performed on Random Dates: To make the auditing process as stringent as possible, auditors will be given the right to audit Nucleus's vaults without prior notice.

Results Made Public: All audit reports will be made public within 14 days of receipt.

Voting on Auditor Selection



No Consecutive Auditing

Audits Performed on Random Dates

Results Made Public

Nucleus Platform: Authentication of Goods

There are three primary components to Nucleus's product authentication solution:

- Document authentication
- Track & trace
- Provenance

Document Authentication

Documents like certificates of origin, crop certifications (fair trade, organic), phytosanitary certificates, conformity assessment certificates, and conflict-free designations are essential in validating the claims made by a seller. However, forgery can make validating the authenticity of these documents a challenge.
Nucleus will solve this problem through the following features:

- **Immutable Blockchain:** Data will be stored on Cobe's unalterable blockchain, which can then be cross-examined with the consent of the seller. Each user's documents will also be linked to their KYC data, de-incentivizing fraud.
- **Independent Expert Reviews Feature:** Both buyers and sellers can have documents independently reviewed by a neutral third party to prevent fraud. These parties will be registered to the platform and be experts in their respective field, including notaries, legal experts, or specialist consultants. Go to page 48 to find out more.

Track & Trace

Nucleus's semi-decentralized end-to-end blockchain based track and trace solution will cover the whole lifecycle of goods from manufacturing to distribution.

Data Matrix Code Technology: Manufacturers will be able to generate and mark products using Nucleus's track and trace system, which will be built using highly secure encrypted data matrix codes. These codes can then be scanned at any point in the product's lifecycle to ensure authenticity, prevent counterfeiting, and track logistics.

User Friendly API & Analytics: Nucleus's track and trace solution will include an API that can be integrated with any third-party modules, allowing for greater utilization and adoption. Desktop and mobile versions, with user-friendly interfaces, will also be developed and provide comprehensive analytics.

Provenance

The following features of Nucleus's provenance applications will allow for more advanced authentication:

Advanced Analytics: Users will have access to data on a product's entire supply chain history, using IoT devices to collect and store data on location and custody history, environmental conditions of the journey, and accelerometer information for damage assessment. This will all be stored on Cobe's blockchain.

Provenance APIs: Nucleus's provenance applications will come with a suite of APIs that developers building dApps on Cobe's blockchain will be able to utilize. This is because the provenance requirements of each business differ depending on the nature of goods, production process, transportation type, and travel route. By providing a robust set of provenance APIs, Nucleus will dramatically reduce the time, skill, and cost required to build product authentication applications. No other blockchain provides this facility to developers looking to build on its network.

Integration with Nucleus's Cross-Border Trade and DeFi Platforms: Nucleus's provenance applications will be integrated with Nucleus's cross-border trade and decentralized finance platforms. This means that the release of payments from the smart escrow account can be synergized with the provenance data, which can track metrics such as the location of goods, their authenticity, and potential damage.

Such data can also be used to estimate the lending requirements and associated risk for a particular transaction.

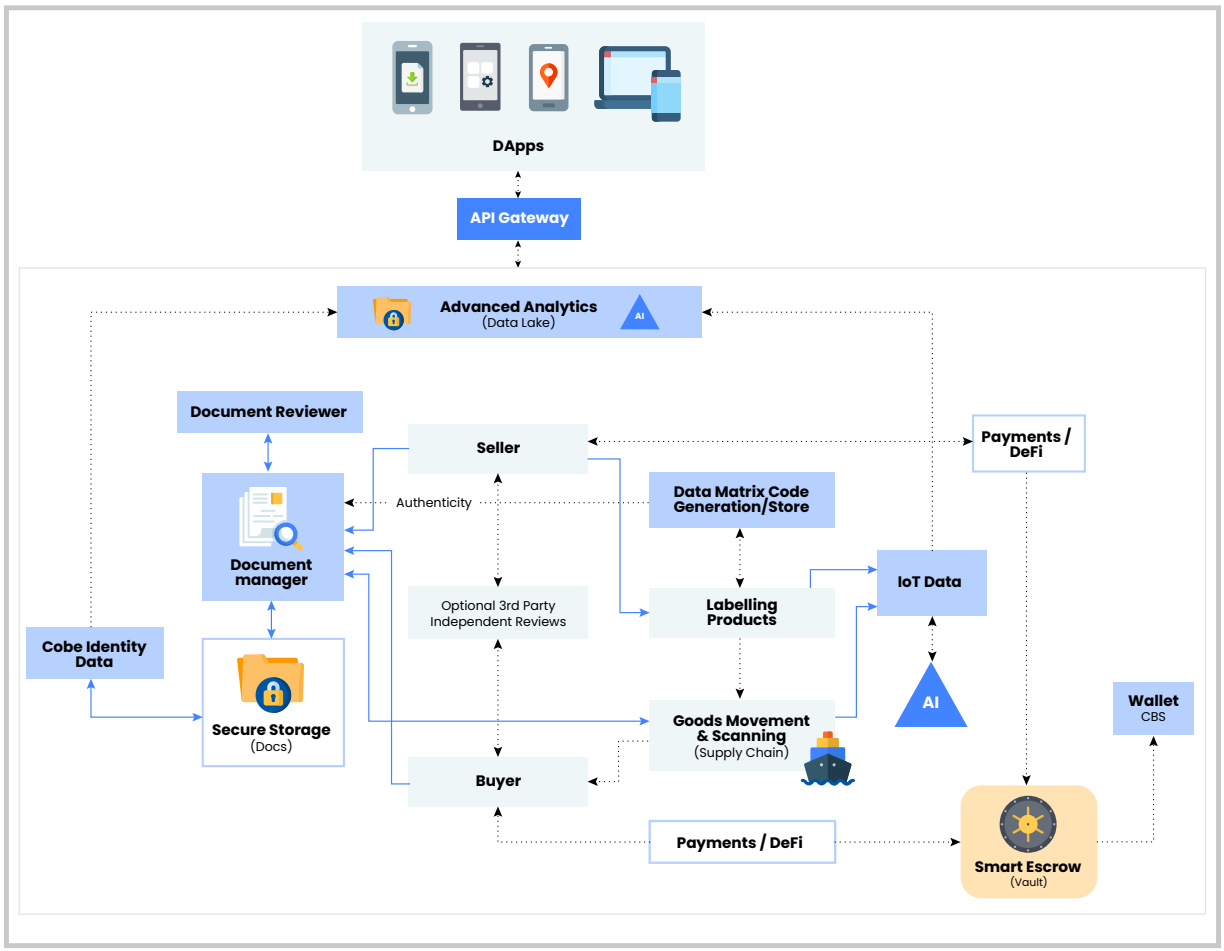


Figure: Nucleus's product authentication architecture

Nucleus: Product Authentication Platform Technology Stack

Layer	Features			
Tags	RFID tags	NFC	QR Code	Barcode
Scanner	RFID Scanners, Smart Phone With (NFC / QR Code Readers), Barcode Scanners			
Application / Service	Frontend & Backend Apps, Application Programming Interfaces (APIs), Smart Contracts (Languages: React, Node, Solidity, Go)			
Database	NoSQL (MongoDB), SQL			
Coins/Token	Cobe's Native Coin (CBE	Cobe Stable Coin (CBS)	Approved Coins & Tokens	
Blockchain	Cobe's Native Blockchain, Consensus (CPoS, CPoA)			
Infrastructure Layer	Network, Compute & Storage (Cloud Services: Amazon WebServices, Google Cloud)			

Differentiation From Other Authentication Platforms

Holistic Approach: Most track and trace applications are limited to just that, while Nucleus provides a more comprehensive three-pronged approach that includes track and trace, document validation, and provenance. It also provides synergy with Nucleus's cross-border trade and DeFi platforms, which is not possible via standard authentication platforms.

Independent Expert Review Feature: This authentication feature is unique to Nucleus.

Servicing SMEs: Most authentication platforms are centralized and designed for larger enterprises. Although Nucleus can serve the needs of large enterprises, the platform will be equally adept at serving the needs of smaller businesses.

Lower Fees: Nucleus benefits from multiple revenue streams, such as its smart escrow contract facility to secure payments and decentralized finance offerings. Because of this, it can reduce the cost of its authentication services, in comparison to competitor platforms, and still achieve higher net profit per user.

Faster Adoption: Due to Nucleus's multiple value adding services, it is not reliant on one single channel to attract new users. However, it is likely that most users who use another service on the platform will also take advantage of Nucleus's authentication services – resulting in a faster adoption rate.

Feature	Competitor Authentication Platforms	Nucleus
Holistic Approach Including Document Validation, Track & Trace & Provenance	No	Yes
Transaction Fees	Higher	Lower
Adoption Channels	One	Multiple
Focus	Large Enterprises	Large & Small
APIs	No	Yes
Synergy With Cross-Border Payments	No	Yes
Synergy With DeFi	No	Yes

Nucleus Platform: Dispute Resolution

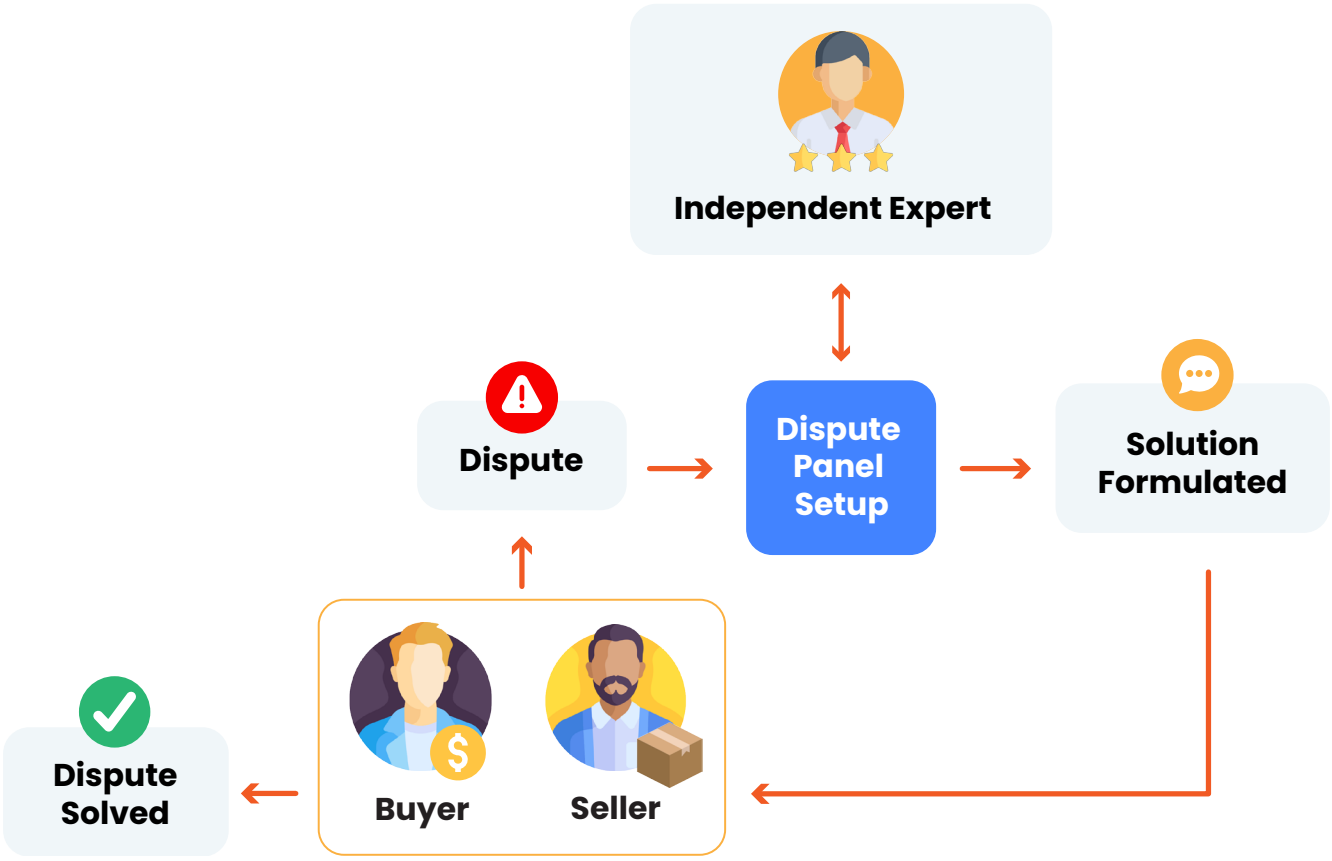
Disputes between buyers and sellers are not uncommon, which is why Nucleus will resolve them as effectively as possible using minimal centralization.

Lowering the Frequency of Disputes

Nucleus will bring clarity to the major areas where disagreements occur, reducing the number of disputes between parties.

This will be accomplished with the following features:

Independent Expert Reviews: Independent third-party experts, like legal professionals, notaries, and consultants, will be able to sign up to the platform, giving both buyers and sellers access to document validation for certificates and KYC for an agreed fee. These experts will need to provide a report for each transaction, improving their rating and credibility on the platform. In addition to minimizing document forgery, this feature will reduce KYC fraud, as expertly validated KYC will be much more credible than non-validated documentation.



Lean Product Development: Nucleus will start by launching the simplest version of an application, and then use real-time feedback to develop it further.

Clear Sales Contract Terms: Transaction terms are defined by sales contracts, which is why Nucleus's sale contracts template will use clearly defined and unambiguous conditions that avoid gray areas.

Funds placed in the smart escrow by the buyer can be paid to the seller once the inspection certificate information, issued by one of the top four global inspection companies, has been uploaded. These companies are French Bureau Veritas Group, Cotecna, Intertek, and Swiss SGS. This will be mandatory for nations that require pre-shipment inspections, and optional (but recommended) for other countries. By presenting this data in an easily verifiable manner, reputable third parties will be able

to validate goods and limit disputes over quantity and quality of goods delivered.

Track Record Data: All user transactions will be tracked and given a score based on how well they meet their obligations, with higher scores signifying greater credibility and resulting in increased benefits. This will incentivize users to meet their obligations and avoid disputes.

Low Risk Payment Terms: Buyers will have the option to split payments into three instalments: an initial deposit, payment upon shipment, and payment upon delivery. If no upfront deposit is paid to the seller, the seller is still secured since the buyer will be required to deposit the funds needed to fulfil the transaction in advance in smart escrow, which must be released to the seller if they meet their obligations.

Minimal Benefits for Bad Actors: Users won't gain anything by refusing to fulfil their obligations. If a buyer goes against their agreement and refuses to release funds on shipment of goods, the money will not be returned to them. Instead, the funds will remain in the smart escrow account unless the seller consents to the refund as well. On the flip side, if the seller does not ship goods, the funds will not be released to them. In both scenarios, the only outcome will be a bad track record and the risk of potential suspension from the platform.

Resolution of Confirmed Disputes

For the disputes that do occur, users will be able resolve them via the following options:

Expert Mediation Panel: An Expert Mediation Panel will be put in place for users unable to resolve disputes between themselves. This feature will see the invitation of an independent expert (or experts) registered to the platform to mediate, acting as a neutral entity who will deliver suggested action plans to resolve the issue. For each dispute that's resolved, the mediation panel member's rating will increase – making them more likely to obtain further work.

Legal Channels: If all measures fail, including the efforts of the expert mediation panel, then buyers and sellers will have the option to go through formal legal channels. In these cases, users will be at an advantage as all matters related to the transaction will be securely recorded on the platform, for greater transparency.

Nucleus Platform: Overall Role in Dispute Resolution

Nucleus won't make business decisions on behalf of users, which is why it will take a decentralized approach to disputes.

This is made feasible via a well-designed system where numerous resolution mechanisms are put in place, including independent expert reviews, transparent sales contracts, and minimal benefits for bad actors.

Nucleus Platform: Analytics & User Ratings

For better decision-making, Nucleus will provide a suite of analytics that includes a rating score for each user.

Each user's rating will be based on their performance on the Nucleus platform, with the metrics including the number of successful transactions performed and obligations met. Every user's rating score will be visible on the platform.

To maintain confidentiality, in-depth analytics regarding user activity will not be publicly available – including a users' individual transactions and the feedback they've received. However, users will have the option of sharing this data if they want to prove their track record to a trading partner.

Nucleus Platform: User Rating Formula

Below is a high-level mathematical description of how each user's rating score on the platform will be calculated, detailing the parameters that will be taken into consideration. More parameters are likely to be added to the user rating formula as the platform evolves.

(All parameters must be scaled between 0–1)

Parameter 1: Number of cross-border transactions (CBT) successfully completed:

$$Min(CBT) = 0,\ Max(CBT) = 1$$
$$0 \leq CBT \leq 1$$

Parameter 2: Total revenue of transactions completed (TRT):

$$Min(TRT) = 0,\ Max(TRT) = 1$$
$$0 \leq TRT \leq 1$$

Parameter 3: Number of different users successfully transacted with (NDT),

$$Min(NDT) = 0,\ Max(NDT) = 1$$
$$0 \leq NDT \leq 1$$

Parameter 4: Rating given by counterparties transacted with (CPR),

$$Min(CPR) = 0,\ Max(CPR) = 1$$
$$0 \leq CPR \leq 1$$

Parameter 5: Number of DeFi loan obligations successfully met (NDLO),

$$Min(NDLO) = 0,\ Max(NDLO) = 1$$
$$0 \leq NDLO \leq 1$$

Parameter 6: Penalties for failing to meet transaction obligations (P),

$Min(P) = 0,\ Max(P) = 1$
$0 \leq P \leq 1$

The User Rating Score can thus be calculated using the equation below:

$$\mu_s = \omega_1 * CBT + \omega_2 * TRT + \omega_3 * NDT + \omega_4 * CPR + \omega_5 * NDLO - \omega_6 * P$$

where:
$\mu_s = User\ Rating\ Score$

$\omega_1, \omega_2, \ldots \omega_6$ are weights assigned to each parameter. The minimum value of a weight can be 0 and the maximum is 2. The value of μ_s is scaled between 0 and 10.

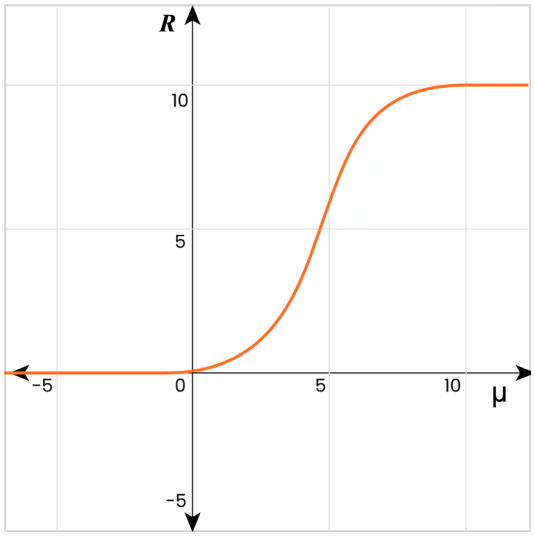
Therefore, $0 \leq \mu_s \leq 10$

$$R = \frac{R_{max}}{1 + (R_{max} * \mu_{max} * e^{-\mu_s})}$$

where:
$R = User\ Platform\ Rating\ (0 \leq R \leq 10)$
$R_{max} = User\ Platform\ Rating\ max.$
$\mu_{max} = User\ Rating\ Score\ max.$

Therefore, if we input the values of R_{max} and μ_{max} , this equates to:

$$R = \frac{10}{1 + (100 * e^{-\mu})}$$



Nucleus Platform: User Adoption & Growth

Nucleus aims to deliver high adoption rates via the following mechanisms:

Focused Launch: A lean approach to launching new products will be adopted that focuses on delivering one high value service at a time. New features will then be introduced to each product based on real-time user data – maximizing user adoption and retention.

Unparalleled Value: Nucleus's smart cross-border trade platform, which secures cross border transactions for both buyers and sellers, will be launched first. Fees will be around 5% of the price of a typical LC, and transactions will take just minutes to execute as opposed to weeks. This, in combination with the fact that there is no direct competitor, will boost the rate of user adoption and retention, which will continue to grow with each new service that's launched – including Nucleus's DeFi and product authentication services.

Incentives for Early Adopters: Nucleus will implement the following measures to generate a high level of early adoption:

- **Lower Transaction Fees:** Early adopters will be rewarded with a substantial discount on transactions, followed by additional benefits that will keep them committed.

- **Referral Programs:** A referral program will be put in place, with free transactions being awarded for each referral.

Expert Team: Cobe's team includes members dedicated exclusively to meeting adoption and retention targets, each with a strong background in creating multi-sided platforms from both a marketing and product development perspective.

Cobe's Blockchain Solution

Cobe's Dual-Side Blockchain Architecture: Why Is it Essential?

For a cross-border trade ecosystem to solve the greatest range of challenges, it requires a blockchain solution where both permissioned and permissionless chains work in synergy. This is because certain applications are better suited to one or the other.

A permissionless chain enables the highest degree of transparency, democracy, and participation, while a permissioned chain offers more confidentiality.

A permissioned protocol, such as Proof of Authority (PoA), is also better suited to setting fixed transaction fees when compared to more decentralized protocols, such as Proof of Work (PoW) and Proof of Stake (PoS).

Fixed transaction fees are an essential requirement for many cross-border trade applications so that businesses can better manage the associated costs.

For example, for provenance applications, which involve large numbers of daily microtransactions, even small fluctuations in transaction fees can result in larger variations in costs. Therefore, even small changes in transaction fees can make such applications impractical for most businesses to consider, making fixed transaction fees a prerequisite.

Cobe has solved this problem by developing a dual-sided blockchain architecture, which includes a permissionless Proof of Stake chain working in synergy with a permissioned proof of authority chain. This means application developers will have the flexibility to choose the best option for their specific needs. No other blockchain offers such a comprehensive solution, giving Cobe a distinct competitive advantage.

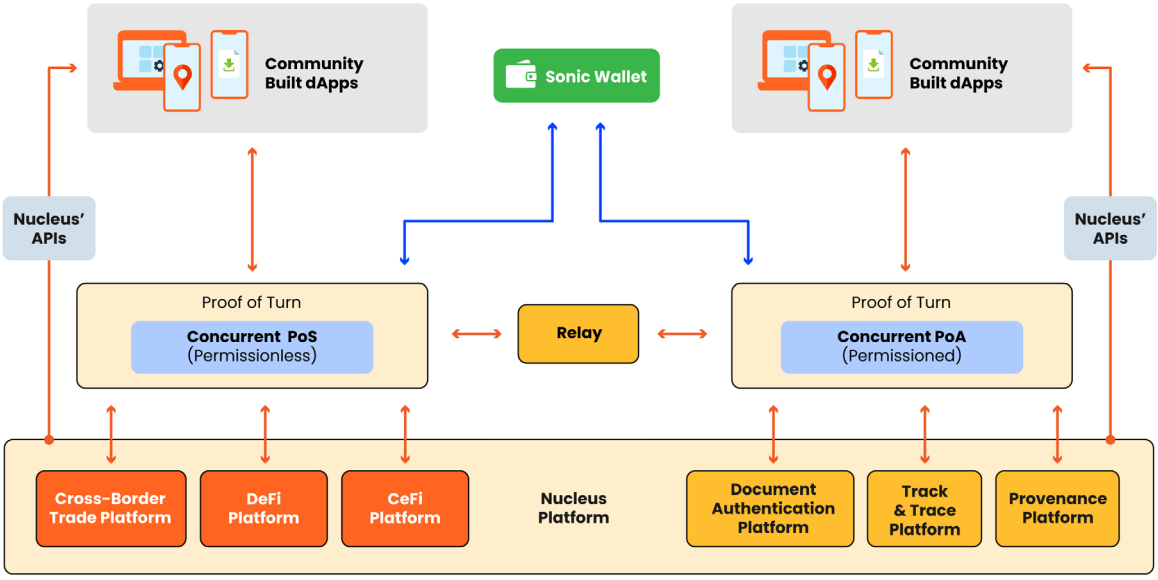


Figure: Cobe's dual-sided blockchain architecture

As shown in the image above, Nucleus's cross-border trade, DeFi, and CeFi platforms (discussed in depth earlier in the paper) will all primarily operate on its permissionless proof of stake blockchain, as decentralization and transparency are high priorities.

In comparison, Nucleus's native document authentication, track and trace, and provenance applications will be built on its permissioned Proof of Authority blockchain, as confidentiality and fixed transaction fees are essential prerequisites for these.

Proof of Turn: A Novel Blockchain Consensus Protocol Developed by Cobe

The rapid growth in the number of applications being built on blockchain networks has resulted in an increased demand for high transaction speeds, which legacy consensus protocols are struggling to meet.

To meet this demand, Cobe has developed a novel consensus protocol called 'Proof of Turn'.

The objective of Proof of Turn (PoT) is to increase the block creation throughput, resulting in a dramatic increase in the rate at which transactions can be executed.

Current consensus protocols choose the next block creator from the available pool of validators via a random selection process. As this process is done one block at a time, it creates a significant delay in block throughput.
PoT overcomes this problem by using the validators in the network to create a 'block schedule' in advance that securely determines the sequence of next block creators. This removes the unnecessary time delay that is experienced by legacy consensus protocols, which only allow for one block creator to be selected at a time.

To generate its universally unique random schedules in a secure fashion, PoT utilizes the computer science concept of cellular automata. Each validator in the schedule creates their block in accordance with the 'turn method'. Because of this, the protocol's consensus algorithm has been named 'Proof of Turn'.

In summary, Proof of Turn boosts transaction speeds and ensures that the blockchain remains secure via the following mechanisms:

No Wait Time: As the validators in the network do not have to wait to select the next block creator one at a time, the associated wait time is eliminated, boosting throughput.

Rejection of Unscheduled Nodes: Validators can only create nodes in accordance with their turn. If a node tries to create an unscheduled block, the block immediately gets rejected, and the node penalized.

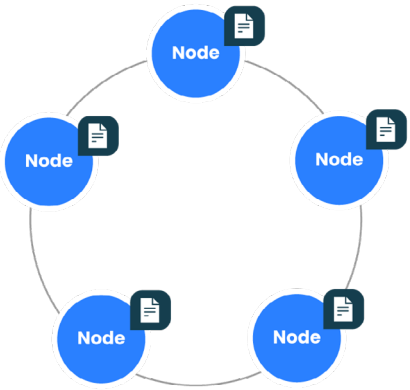
Constraints Enhancing Blockchain Security: Proof of Turn allows specific constraints to be enforced to help prevent fraudulent transactions, resulting in increased blockchain security. For example:

Two consecutive blocks cannot be generated by one validator
A validator cannot generate more than the number of blocks that have been allocated to it per round or cycle.

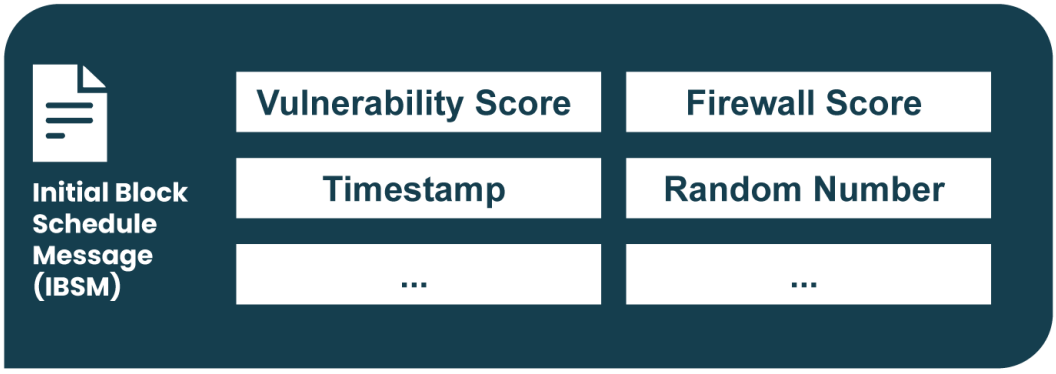
Proof of Turn (PoT) Working:

Each validator creates a new 'block proposal' and shares it with the other validators in the network.

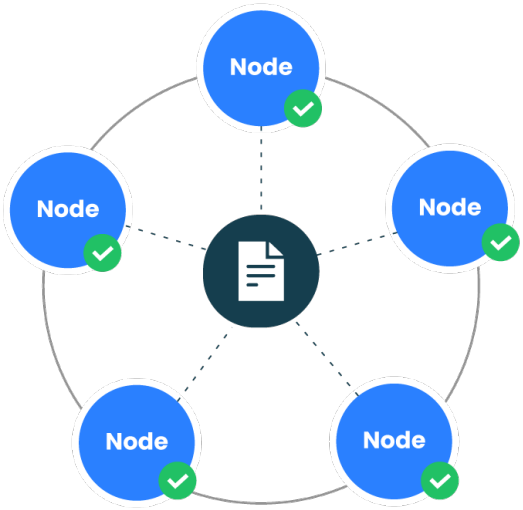
1. Each validator creates a new Initial Block Schedule Message (IBSM) and shares it with the other validators in the network.



2. Each IBSM contains the necessary information required by Cobe's Proof of Turn consensus protocol to formulate the next 'block schedule'. This includes the validator's vulnerability and firewall scores, its initial true random number, and a timestamp field.

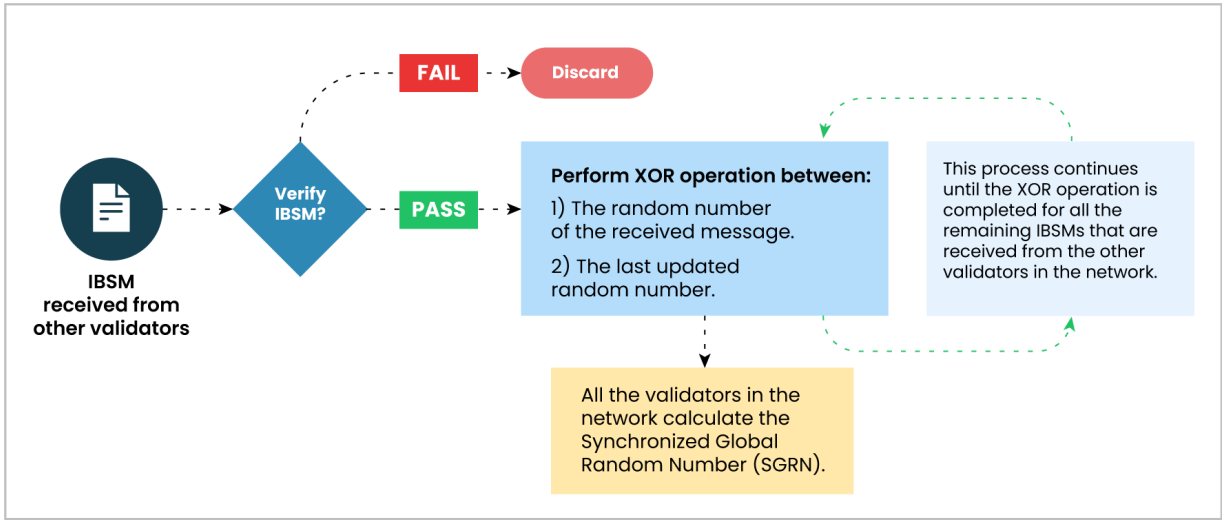


3. Each validator verifies the integrity of the IBSM received from the other validators in the network.

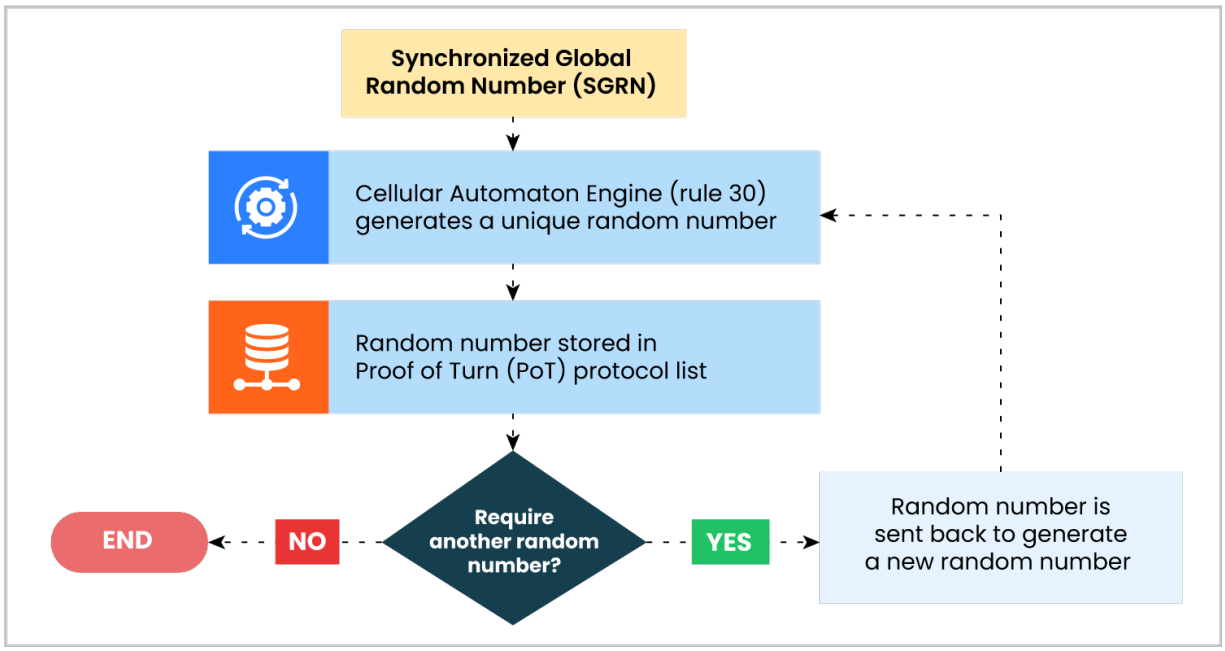


4. If a IBSM is verified, then the receiving validator performs an XOR operation between (1) the random number of the received message and (2) the last updated random number. This process continues until the XOR operation is completed for all the remaining IBSM that are received from the other validators in the network.

5. All the validators in the network then calculate the Synchronized Global Random Number (SGRN).



6. The SGRN is then fed into the Cellular Automaton Engine (CAE) to generate more random numbers. In this phase, all the validators in the network generate a copy of the globally synchronized block schedule.



For a more detailed technical understanding of the Proof of Turn (PoT) consensus protocol, please read Cobe's yellow paper, which is available at www.cobe.network

Concurrency

In computer science, concurrency is defined as the ability of different parts of a program or algorithm to be executed out-of-order, without affecting the outcome. Blockchain, by design, consists of a series of blocks, with each block cryptographically linked to the one created prior. Because most legacy blockchain protocols don't allow for blocks to be created simultaneously, the throughput they can achieve is severely restricted.

To dramatically boost its transaction speeds, Cobe has developed a novel set of concurrency protocols that not only enable parallel transactions to be executed within a single block but also allow the parallel creation of entire blocks.

Concurrent Block Creation

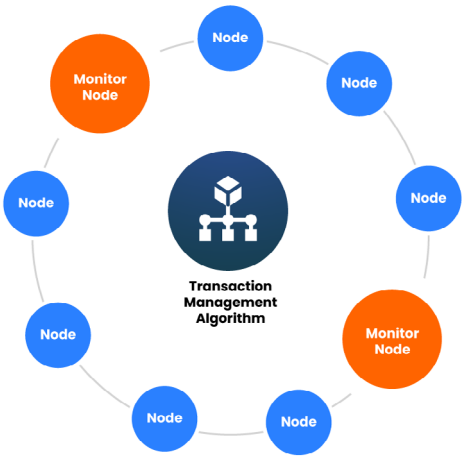
For concurrent block creation, Cobe has developed two novel approaches:

Load Aware Concurrent Fork-Chains: The greater the demand (load) on a blockchain, the longer it takes for transactions to be executed. This is a significant problem for legacy blockchains. Cobe's 'Load Aware' concurrency protocol removes this time delay by enabling parallel fork-chains (fchains) to be created when the demand on the network increases.

Each fork-chain in the network operates in parallel with the main chain and uses the same consensus protocol. However, each fchain creates its own block schedule, made possible via Cobe's Proof of Turn consensus protocol discussed earlier. At the end of each round, all the fork-chains created are integrated into the main chain.

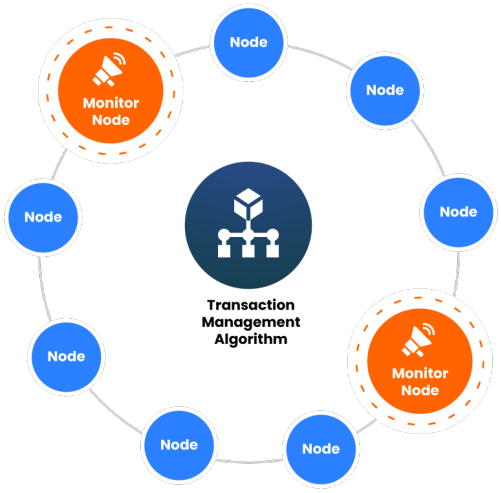
Cobe's load aware concurrency protocol is highly adaptive, as fork-chains are only created when the load on the network increases.

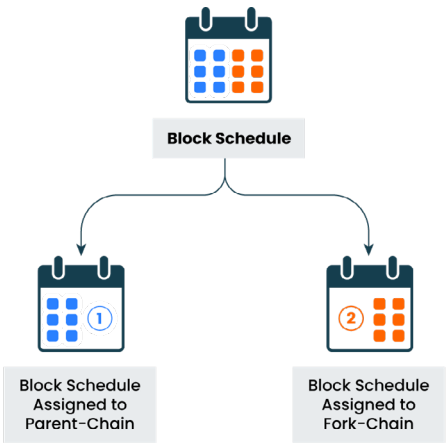
Working of Load Based Fork-Chains



1 At the start of each round, several validator are selected (via a round-robin process) to monitor the size of the transaction pool.

2 If there is a requirement for an fchain to form, the Monitor Nodes multicast a fork() message on the network. A fork-block is subsequently added to the parent chain.

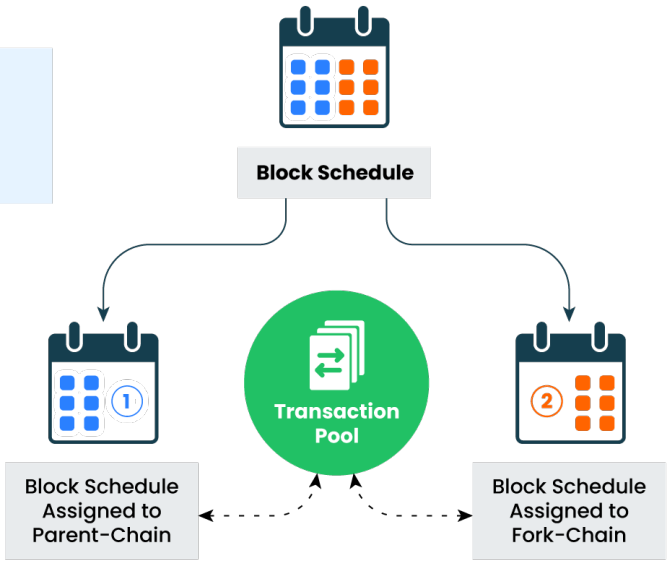


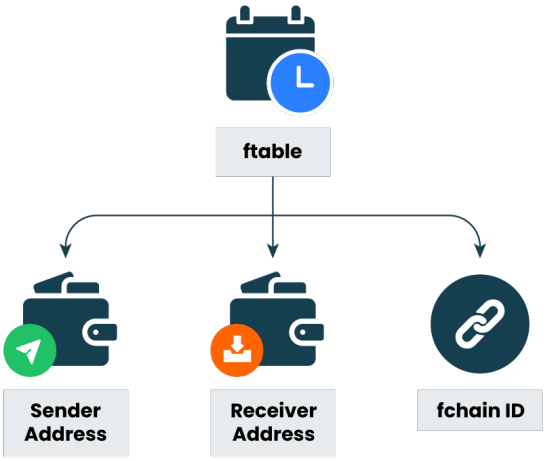


3 The Block Generation Schedule created at the start of the round via Cobe's Proof of Turn (PoT) protocol is split into two halves. The first half is assigned to the parent chain and the second half of the schedule to the fchain.

4

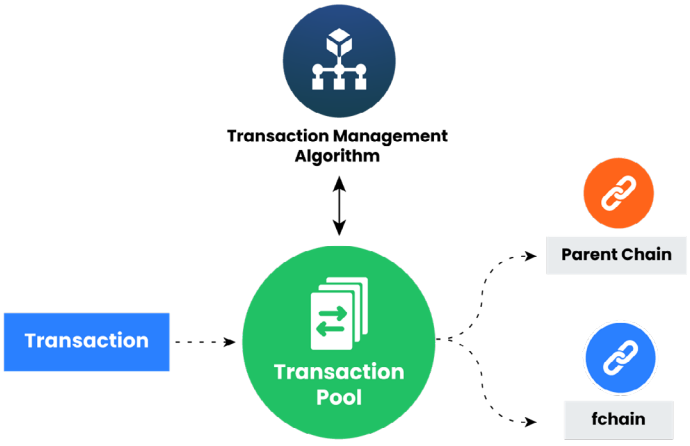
Both the parent chain and the fchains use the same transaction pool.





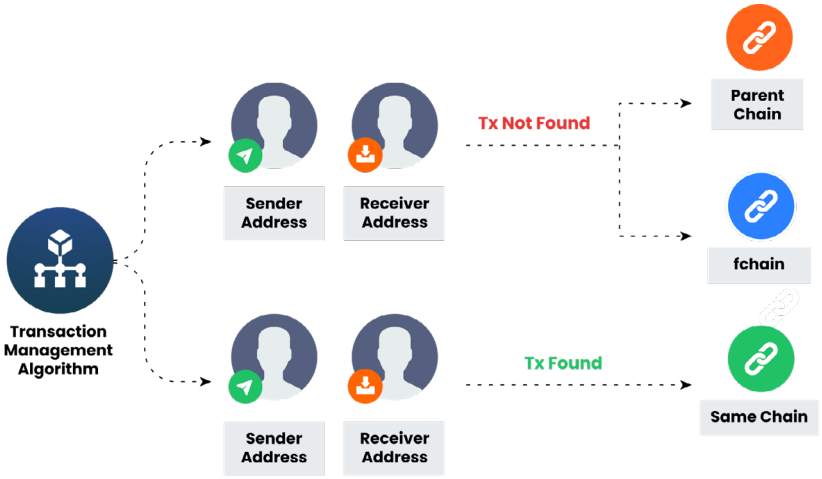
5

A new ftable is created. This ftable includes the following fields: (i) addresses (of the sender or receiver) (ii) fchain ID. The fchain ID field is used to track which fchain processed each individual transaction.



6

When a new transaction is submitted in the transaction pool, the Transaction Management Algorithm will assign the transaction to either the parent chain or an fchain.



7

a) The Transaction Management Algorithm looks up the address of both the sender and the receiver in the ftable. If the address is not found in the ftable, it means that the transaction is a new one. The Transaction Management Algorithm subsequently assigns this new transaction to either chain via a round-robin process and updates the ftable accordingly.

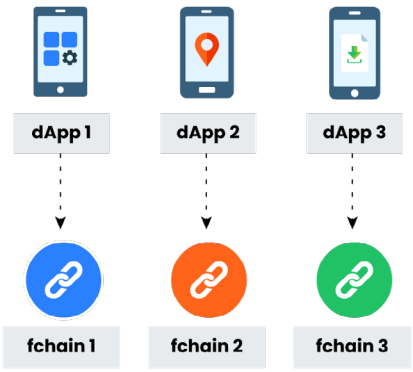
b) If a previous entry of the sender and receiver addresses is found in the ftable, then the Transaction Management Algorithm assigns the transaction to the same chain.

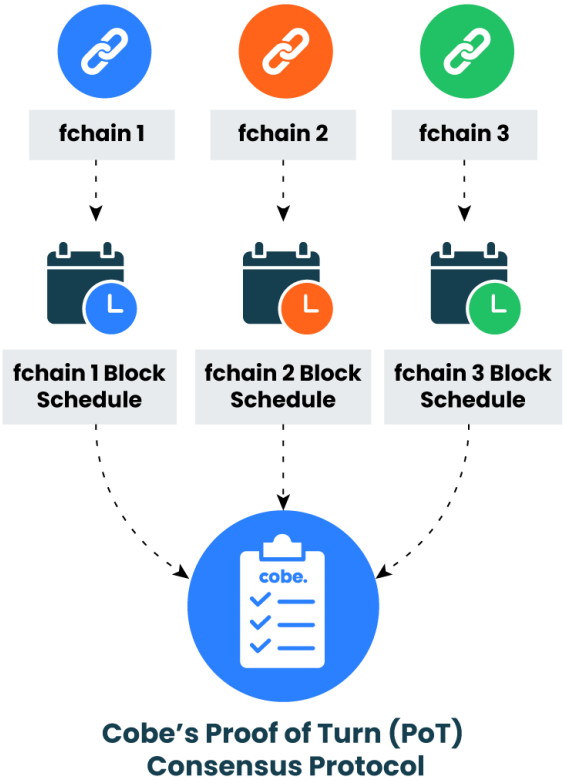
DApp Based Concurrent Fork-Chains: This protocol enables fork-chains to be created for different dApps operating on Cobe's network. As each dApp has its own token, a distinct parallel fchain can be created for each dApp, which integrates into the main chain after each round. This concurrency protocol is particularly useful in reducing the load on the main chain from dApps, which execute a large volume of transactions.

Working of dApp Based Fork-Chains

1

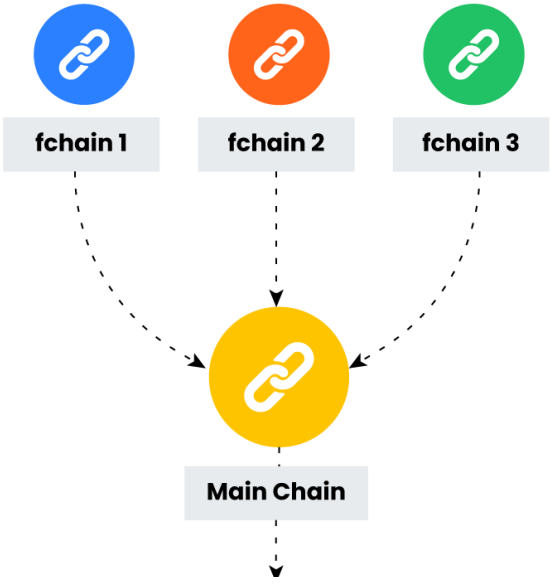
At the start of each round, a distinct parallel fchain is created for each dApp.





4

Each fchain created via this mechanism operates the exact same consensus protocol as the main chain but with its own block schedule; this is made possible via Cobe's Proof of Turn (PoT) Consensus Protocol



5

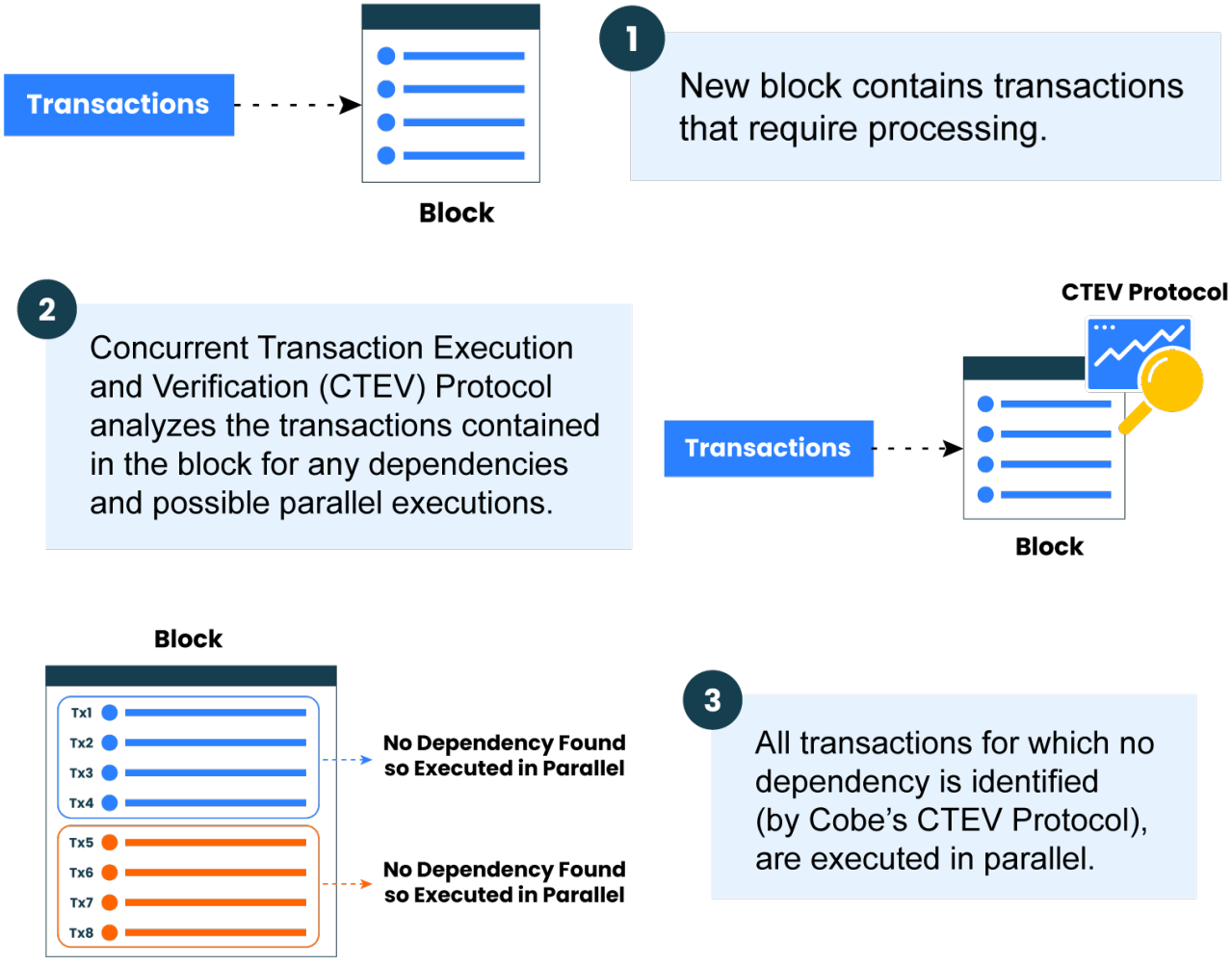
At the end of each round, all DApp based fchains are integrated into the main blockchain.

Concurrent Transaction Protocol (CTEV Algorithm)

Alongside its block creation protocols, Cobe has also developed a novel concurrent transaction execution and verification (CTEV) protocol. This protocol enables transactions within a single block to be executed in parallel, boosting the speed at which they are processed.

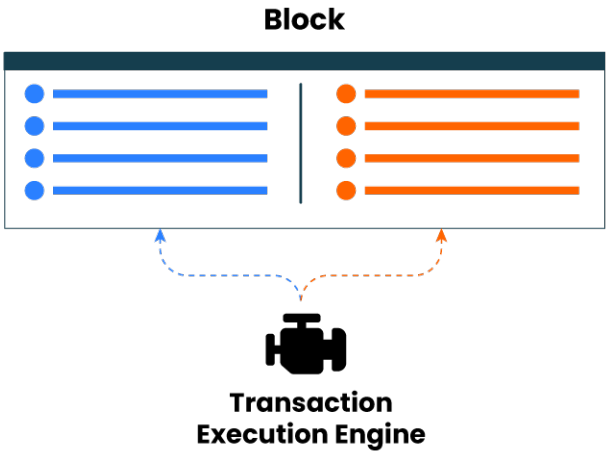
Cobe's concurrent transaction protocol utilizes cutting edge 'static transaction analysis' techniques to both execute and verify the parallel transactions within a block. The protocol works by first arbitrarily placing all the transactions that need to be executed in a linear order. Cobe's CTEV algorithm then divides all the transactions into pairs, with all pairs analyzed to detect potential dependencies between them. Subsequently, all transactions for which no dependency is identified are executed in parallel, significantly boosting transaction throughput.

CTEV Algorithm Overview



4

Execution engine executes the transactions in parallel.



For a more detailed technical explanation of its concurrency protocols, please read Cobe's yellow paper, which is available at [www.cobe.network.](http://www.cobe.network)

Cobe's Permissionless Chain: Concurrent Proof of Stake (CPoS)

For the permissionless component of its blockchain architecture, Cobe has opted for a Concurrent Proof of Stake (CPoS) consensus protocol for the following reasons:

Fast Transaction Speeds: Due to the limited number of validators, Concurrent Proof of Stake (CPoS) can validate transactions faster than both Proof of Work (PoW) and Proof of Stake (PoS).

Energy Efficiency: CPoS requires less hardware and is more energy efficient than PoS.

Greater Participation: CPoS will allow CBE coin holders who do not have the skill, desire, or resources to run their own node to participate in the network and be rewarded in proportion to the amount of stake locked.

Performance: If a block producer does not perform in line with expectations, they can easily be voted out of the system with CPoS, ensuring sustained performance levels.

Reliability & Security: Many successful projects have been launched that utilize the DPoS consensus, such as Cardano and EOS. In addition, extensive research is being conducted globally to further understand and optimize the protocol, giving DPoS an advantage over consensus protocols that lack the same level of traction.

Cobe's Concurrent Proof of Stake (CPoS) Consensus Protocol

Concurrent Proof of Stake (CPoS) is an evolution of the Proof of Stake consensus protocol, developed to achieve higher performance and greater democracy.

Staking Pools

Validators Eligibility Criteria (E_c)
To become a validator, a node must meet Cobe's eligibility criteria. This involves achieving a minimum threshold value for the following parameters:

Node Stake Size (σ_s): This is the number of native tokens (CBE) deposited by the node in its staking pool.

Transaction Fee Distribution

The validators selected to form new blocks will receive the transaction fee upon their validation. The block creation reward is distributed at the end of each epoch.

Block Creation Rounds

In each block creation round, a predetermined number of validators will be selected, who are then responsible for creating the blocks during the round. Cobe will begin with 21 validators being selected for each block creation round, with the number growing as the total number of validators in the network increases.

Validation Share Score

There are several factors that affect the probability of a validator being selected for a block creation round. In addition, once a validator has been selected, these factors affect the probability of how many blocks it will be nominated to create during the next block creation round. These factors cumulate to form a validator's 'Validation Share Score' and include:

Stake Size (σ_s): The greater the amount of CBE staked by a validator, the higher the probability of being elected for the next block creation.

Stake Age (σ_d) : This is defined as the time for which a validator has staked their CBE. The greater a validator's stake age, the higher the probability of them being selected for the next block creation. The problem with relying on stake size alone is that a malicious node can potentially deposit a large stake for a short period, disrupting the network. Incorporating stake age into the protocol limits the effectiveness of such attacks, as the concerned node would not only have to stake

a high amount of coin, but also do so over an extended duration to have impact, making it considerably more challenging. Stake age can be calculated by the following equation,

$$\sigma_d = CBE_{Locked} * \tau_n$$

where

$\sigma_d = Stake\ age\ of\ the\ node$

$CBE_{Locked} = Cobe\ native\ coins\ staked\ by\ a\ node$

Online Age (O): This is a measure of how long the node has been online in the last 'x' number of epochs. Online age is an important indicator of a node's reliability.

A node's online age is calculated via the following equation:

$$O = \frac{\tau_o}{\tau_t}$$

where

$O = Online\ age\ of\ node$

$\tau_o = Total\ no.\ of\ epochs\ a\ node\ remains\ online$

$\tau_t = Total\ no.\ of\ epochs\ under\ consideration$

Reputation Score (RS): Resulting in Greater Democracy & Participation

Cobe's reputation protocol combines a node's stake age, security score, and online age score to calculate its overall 'Reputation Score'. Reputation scores are calculated via the following equation:

$$\rho = \omega_1 * \sigma_d + \omega_2 * o - \omega_3 * \beta_{missed} - \omega_4 * \beta_{bad}$$

where

ρ= Reputation score

ω_1, ω_2, ω_3, and ω_4 are weights assigned to each parameter
O = Online age
β_{missed} = Blocks missed by the validator
β_{bad} = Bad blocks created by the validator

A validator's probability of being selected for the next block creation (its validation share score) is determined via the following equation:

$$VSS = \sigma_s + \rho$$

where

$VSS = Validation\ share\ score\ of\ the\ node.$

Note: All values in above equations are scaled between 0–1

Unlike legacy PoS consensus protocols, Cobe determines a node's probability of being selected not just by its stake size (i.e., its overall wealth) but also by its earned reputation as a reliable actor. This measure acts to level the playing field, providing greater opportunity for nodes that cannot compete on stake size alone to participate in the network.

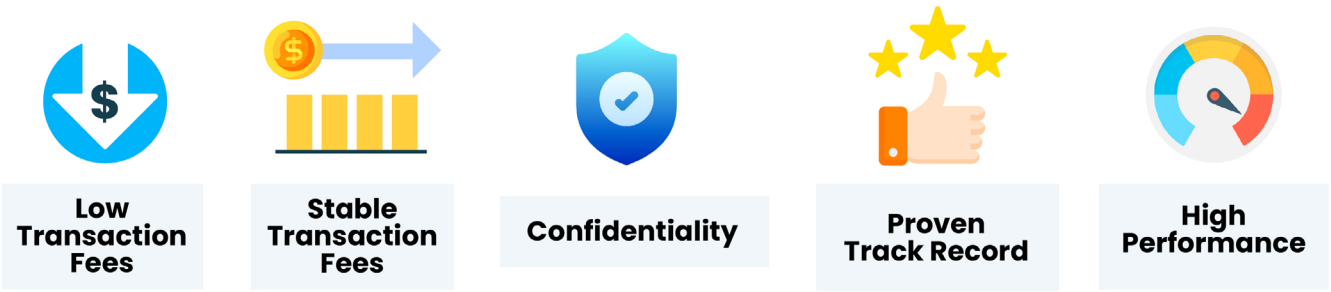
Synergy with Cobe's Proprietary Proof of Turn and Concurrency Protocols

As mentioned earlier, Cobe's consensus protocol utilizes its own proprietary Proof of Turn (PoT) protocol to generate the block creation schedule for each round.

Once the validation share score for all the selected validators has been calculated, this data is then transferred to Cobe's PoT protocol, which subsequently generates the block creation schedule for the associated round.

Similarly, the validation share score is also used by Cobe's proprietary concurrency protocols to determine the number of blocks each validator will create in the network's fchains.

Cobe's Permissioned Chain: Concurrent Proof of Authority (CPoA)



For the permissioned component of its blockchain architecture, Cobe has opted for a Concurrent Proof of Authority (CPoA) blockchain. This protocol has been chosen for the following reasons:

Confidentiality: PoA being a permissioned consensus protocol, it is well suited for retaining a high degree of confidentiality.

Low & Fixed Transaction Fees: The PoA consensus protocol is well suited to delivering both low and fixed transaction fees.

High Performance: The limited number of nodes involved in the validation process means that PoA can enable high transaction speeds and scalability.

Track Record: The PoA consensus protocol has a proven track record, giving it an advantage over untested protocols.

Cobe's Concurrent Proof of Authority (CPoA) Consensus Protocol

Before being accepted as a validator for Cobe's permissioned Concurrent Proof of Authority (CPoA) blockchain, nodes must undergo an extensive KYC process.
In addition, nodes will be required to deposit 350,000 CBE coins with the network via a smart contract. If the validator does not adhere to the terms of the network, the coins deposited may be slashed depending on the type of violation. To maximize compliance, a high barrier of entry has been put in place along with substantial monetary repercussions for bad actors.
To enable rapid transaction speeds and low transaction fees, the network will commence with 21 validators. Over time, this may increase to a maximum of 101.

Eligibility Criteria (E_c):

As discussed, nodes that wish to become validators are required to meet the network's eligibility criteria. This will involve:

- Formal identification and authorization (Ξ)
- Minimum (CBE) account balance (CBE_{Min})
- Achieving the minimum Security Score threshold (κ)

The eligibility criteria can be expressed as follows:

$$E_c = \Xi * CBE_{Min}$$

where

$\Xi = Identification\ Value\ (it\ can\ be\ either\ 0\ or\ 1)$

$CBE_{Min} = Minimum\ Account\ Balance\ (1\ if\ balance\ is\ available,\ otherwise\ 0)$

Formal Identification and Authorization (Ξ): Only authorized nodes are allowed to become validators, having to undergo an extensive KYC process approved by Cobe's governance panel.

Minimum Balance (CBE_{Min}): As mentioned earlier, to become a validator for Cobe's CPoA chain, a node must deposit a minimum of 350,000 CBE. In the interest of maximizing security, performance, and adoption of the chain, the deposit amount can be subject to change. Any change will need to be approved by the chain's governance process via a formal democratic vote.

Reputation Score (ρ): Based on their performance in previous rounds, every validator in the network will build an individual reputation score. The higher a validator's reputation score, the greater the probability of being selected to create future blocks.

On the other hand, if a validator's reputation score falls below a defined threshold, they will be penalized with lower rewards and potentially suspended from the network. In cases where a node is suspended, the security deposit can potentially be slashed, with the funds transferred to Cobe's treasury. Each missed block and bad block created by a validator will adversely affect their reputation score.
A validator's reputation score can be calculated with the equation below:

$$\rho = \omega_1 * \sigma_d + \omega_2 * O - \omega_3 * \beta_{missed} - \omega_4 * \beta_{bad}$$

where

$\rho = Reputation\ score$

$\omega_1, \omega_2, \omega_3\ and\ \omega_4\ are\ weights\ assigned\ to\ each\ parameter$

O = Online age

β_{missed} = Blocks missed by the validator

β_{bad} = Bad blocks created by the validator

Online Age (O): As described earlier, this is a measure of how long a node has been online in the last 'x' number of epochs. Online age is an important indicator of a node's reliability and can be calculated via the following equation:

$$O = \frac{\tau_o}{\tau_t}$$

where

τ_o = *No. of epochs node a node remains online*

τ_t = *Total no. of epochs under consideration*

O = *Online age of node.*

Confidentiality Enhancement Framework for Cobe's CPoA Chain

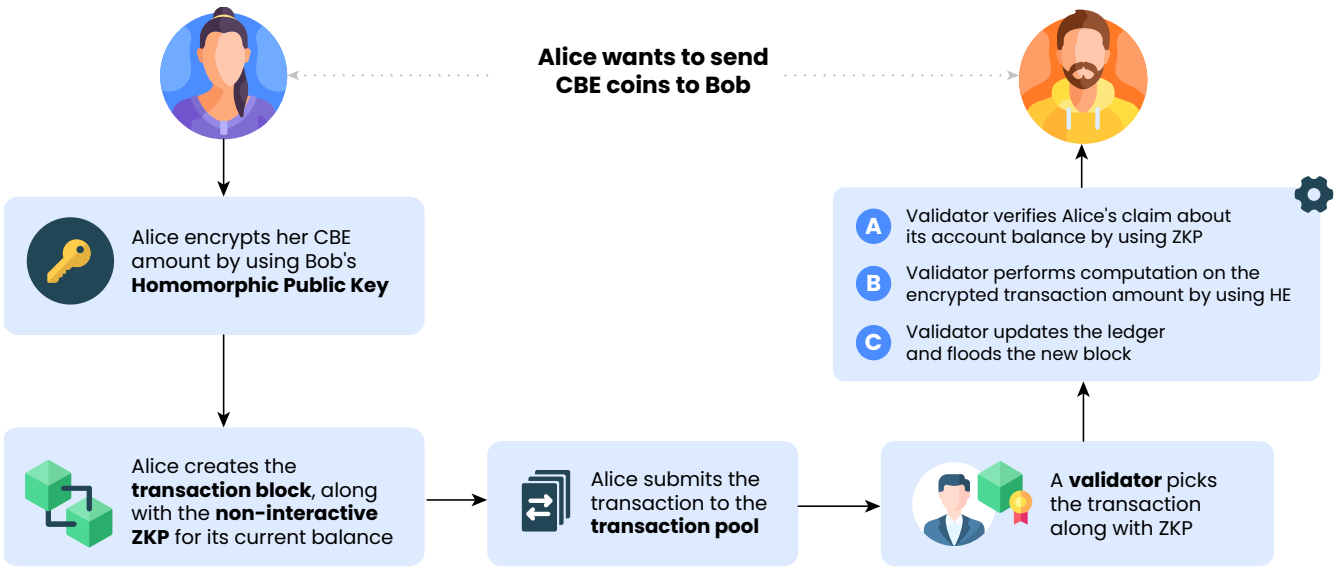
Cobe's CPoA blockchain is designed to offer users a high degree of confidentiality via its 'Confidentiality Enhancement Framework', which ensures that a dApp's data is never unencrypted outside its local environment. This means that only those entities to which a dApp itself has granted access will be able to view its data.

The Cobe Confidentiality Enhancement Framework utilizes a Fully Homomorphic Encryption (FHE) technique combined with Zero Knowledge Proof (ZKP). Cobe's homomorphic encryption scheme allows validators to perform computations on encrypted data, eliminating the need for them to decrypt the data to validate transactions.

$$FHE\ (E(m_1) + E(m_2) + \cdots + E(m_n) = m_1 + m_2 + \cdots + m_n$$

$$FHE\ (E(m_1) * E(m_2) * \ldots * E(m_n) = m_1 * m_2 * \ldots * m_n$$

By using ZKP, one party can prove to another that a given statement is true without sharing any additional information, apart from the fact that the statement is indeed true. For example, a node can provide non-interactive zero knowledge proof of the fact that a user's remaining balance is equal to their previous balance minus the number of tokens that they transferred to a receiver without sharing the actual figures involved in the transaction. The below diagram shows how a transaction is processed in the Cobe's Confidentiality Enhancement Framework.



Synergy with Cobe's Proprietary Proof of Turn and Concurrency Protocols

As discussed earlier, Cobe's consensus protocol utilizes its own proprietary Proof of Turn (PoT) protocol to generate the block creation schedule for each round. Once the reputation score for all the selected validators has been calculated, this data is then transferred to its PoT protocol, which subsequently generates the block creation schedule for the associated round.

Similarly, the reputation score algorithm is also used by Cobe's proprietary concurrency protocols to determine the number of blocks each validator will create in the network's fchains.

Cobe's Blockchain Transaction Fee Model

Cobe has two separate transaction fee models, one for its Concurrent Proof of Stake chain and the other for its Concurrent Proof of Authority chain. All transaction fees are stored in a reward pool for both chains, which is then distributed to the nodes that validated the transactions, at the end of each epoch.

Transaction Fee Model for Cobe's CPoS Chain

The transaction fee for the CPoS chain can be calculated via the following equation:

$$TxFee_{CDPoS} = \varrho + (\vartheta * size(Tx))$$

The key parameters in the equation are:

- The Minimum Transaction Fee (ϱ): This coefficient determines the lowest possible fee per transaction.
- Transaction Size (Tx): The larger a transaction, the higher its cost. Measured in bytes.
- The Transaction Size Multiple (ϑ): This coefficient determines how the size of a transaction impacts its cost.

Transaction Fee Model for Cobe's CPoA Chain

Many cross-border trade applications require fixed transaction fees, so that the businesses using them can accurately forecast their costs. Cobe's CPoA chain provides this facility.
To accomplish this, Cobe has introduced a 'Stabilized-Elastic Fee Model' for its CPoA Chain. This model ensures that, for a specific transaction size range, the fee remains the same. For example, as shown in the table below, all transactions that fall into the nano transaction weight range will have their weight initialized to 0.2, irrespective of their specific weight (all microtransactions at 0.4 etc.).

Weights (ω)	Value
Nano Transaction	0.2
Micro Transaction	0.4
Mini Transaction	0.6
General Transaction	0.8
Macro Transaction	1.0

In addition, Cobe's CPoA transaction fee model utilizes a 'Stability Coefficient' (η), which pegs the cost of a transaction to set dollar values. Although transaction fees are paid in CBE, the amount paid for each weight category will always be equivalent to a specific dollar amount, as most businesses involved in cross-border trade calculate their costs in fiat.

Below is the mathematical representation of the transaction fee model for Cobe's CPoA:

$$TxFee_{\ CPoA} = (\eta * \omega) - CBE_{\ discount}$$

For further information of Cobe's transaction fee models, please refer to Cobe's yellow paper at www.cobe.network

Cobe's Inflation Economics

A well-designed blockchain ecosystem must have carefully considered measures in place to appropriately manage the currency's inflation.

Like all major blockchains, such as Ethereum, Solana, Polkadot, and Cardano, Cobe will mint new coins on an annual basis. This is required to pay staking rewards to CBE coin holders and validators while fueling the growth of the ecosystem. As with all cryptocurrencies, a certain number of coins will be accidently lost each year by their holders, so minting is also necessary to substitute coins in the ecosystem.

Below is the terminology required to understand Cobe's inflation model:

Terminology	Definition
Total Current Supply (TCS_{CBE})	The number of CBE coins (either locked or unlocked) that have been created to date, excluding any burned coins.
Inflation Rate [%] (IR)	Defined as the annual rate of increase in the Total Current Supply of CBE.
Initial Inflation Rate (IIR)	Refers to the inflation rate when it is initially implemented. The initial target range for this is 8-10% per annum.
Inflation Reduction Coefficient (IRC)	This is the rate at which inflation falls over time. The target range for this coefficient is 12–18% per annum.
Long Term Inflation Rate [%] (LIR)	This is the expected long-term inflation rate. The target range for this is 1.5–2% per annum.
Staking Reward (SR)	The annualized rate of return given to CBE coin holders for staking their coins.
Base Staking Reward (Π)	The minimum annual staking reward that will be received by CBE holders that have locked.

Terminology	Definition
CBE Locked (CBE_{Locked})	To receive staking rewards, a user must lock their CBE coins for a minimum number of epochs. CBE Locked represents the number of CBE coins that are locked.
Minimum Staking Period (ϵ)	This is defined as the minimum number of epochs for which CBE coins are required to be locked to receive staking rewards.

CBE Inflation Schedule (CIS)

The CBE inflation schedule determines the annual inflation rate, which is set to decrease year on year.

The inflation rate for the new cycle (year) can be calculated via the following equation:

$$IR_{NEW} = \zeta * (LIR) + R_{CUR} * (\frac{100 - IRC}{100})$$

where

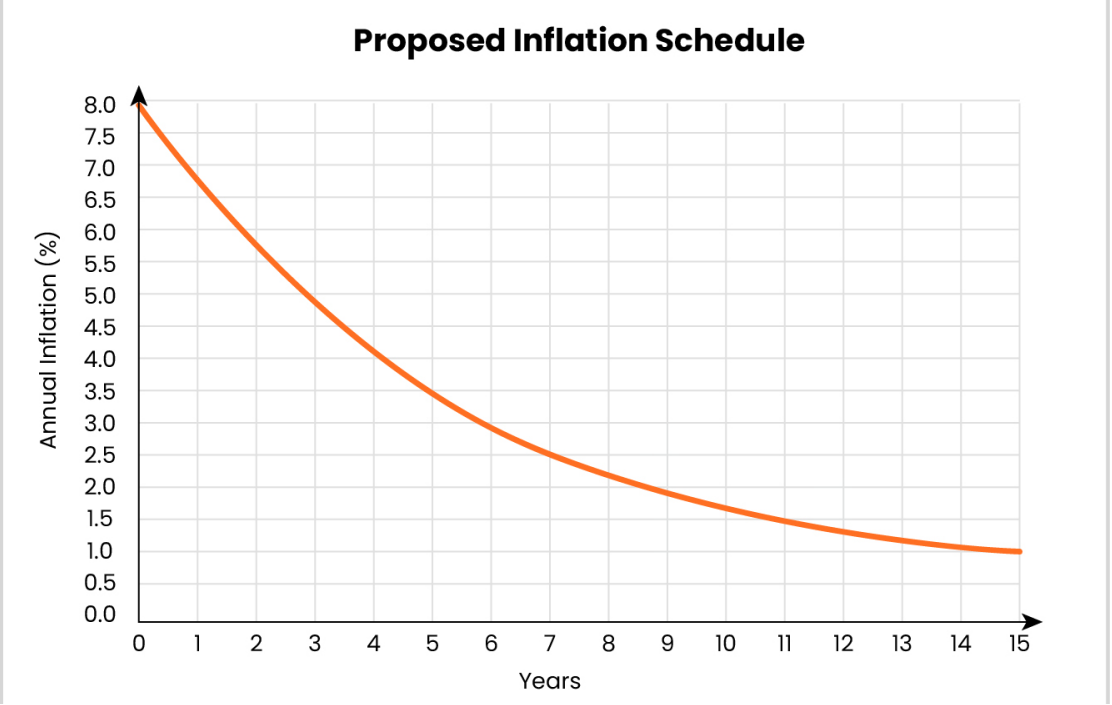
$IR_{NEW} = Inflation\ Rate\ for\ next\ year\ /\ cycle$

$IR_{CUR} = Inflation\ Rate\ for\ this\ year\ /\ cycle$

$IRC = Inflation\ Reduction\ Coefficient$

$LIR = Long\ Term\ Inflation\ Rate\ (0–2\%)$

$\zeta = Long\ Term\ inflation\ Coefficient\ (0\ or\ 1).$



The hypothetical graph above shows how inflation rate will decrease over time

CBE Coin Burning

To ensure inflation of CBE always remains within the desired range, Cobe will utilize three distinct coin burning methods in addition to its inflation schedule:

Circulating Supply CBE Burning: This involves burning a percentage of the CBE supply in circulation. Implementing this mechanism will require a governance vote by Cobe's community.

Total Supply CBE Burning: This involves burning a percentage of the total number of CBE minted to date. Again, implementing this mechanism will require a governance vote by Cobe's community.

Transaction Fee Burning: This involves burning a proportion of the transaction fee while allocating the remainder toward staking rewards. This mechanism will only be instigated if inflation is deemed to be too high and Cobe's community votes for a reduction in the circulating supply of CBE

Coin burning, particularly total supply and circulating supply coin burning, is intended to be a last resort measure to curb inflation. It can only be implemented via a community-wide governance vote where a large majority of voters believe it would be of benefit to the ecosystem.

Staking Reward (SR)

CBE coin holders who stake their coins will be issued with staking rewards.

In addition to the base minimum staking reward, validators can further increase their staking rewards based on the following parameters:

Lock in Duration (LiD): The longer a validator locks in their CBE for, the greater the staking rewards they will receive above the base minimum. Lock in duration can be calculated by using the formula:

$$LiD = \frac{LiD_{o}}{LiD_{t}}$$

where

$LiD_{o} = No.\ of\ epochs\ a\ user\ locked\ his\ coins$

$LiD_{t} = Total\ no.\ of\ epochs\ under\ consideration.$

Reputation Score: The higher the validator's reputation score, the greater the staking reward they will receive above the base minimum.

The staking reward issued to a validator for both Cobe's permissionless CPoS and permissioned CPoA chain can be calculated via the equation below:

$$SR = SR_{base} + \frac{\rho_{th}}{1 + e^{(\Pi - \rho)}}$$

where

$\rho_{th} = User's\ reputation\ threshold\ (SR_{base} + \rho_{th}) \leq SR_{Max}\ i.\ e.\ (\rho_{th} = 3)$

$\rho = User's\ reputation\ score\ (0 \geq \rho \leq 10).$

A node's reputation score (ρ) will be calculated using the equation below and then inputted into the Staking Reward equation above:

$$\rho = \omega_{1} * O + \omega_{2} * \frac{CBE_{Locked}}{TCS} + \omega_{3} * LiD - (\omega_{4} * \beta_{missed} + \omega_{5} * \beta_{bad})$$

where

ω_1, $\omega_{2,}$ ω_3 *and* ω_4 *are weights*

$\omega_1 + \omega_2 + \omega_3 + \omega_4 + \omega_5 = 1$

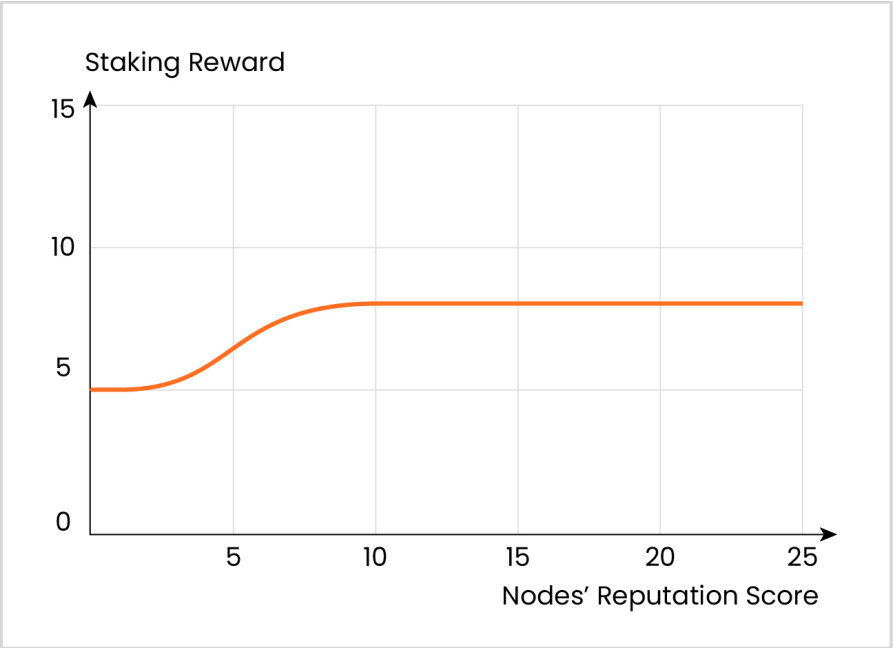
$O = Validator's\ online\ age\ (0 \leq O \leq 1)$

$\beta_{missed} = Blocks\ missed\ by\ a\ validator,\ can\ be\ 0\ or\ more.$

Its value is normalized between 0—1

$\beta_{bad} = Bad\ blocks\ created\ by\ the\ validator,\ can\ be\ 0\ or\ more$

Its value is normalized between 0–1.



The figure above shows how a node's reputation score affects its staking reward.

Cobe's Blockchain: Secured Against Quantum Computers

Public key cryptography, also known as asymmetric key cryptography, is an essential component of blockchain technology. Without it, a blockchain network would essentially cease to exist.

A public key cryptosystem relies primarily on two keys, one public and the other private. Data encrypted with the private key can only be decrypted by the public key and vice versa.

In blockchain, every transaction is digitally signed by the owner of the wallet. This gives assurance to the nodes on the network that the transactions are valid.

The digital signature depends primarily on two functions, sign and verify. The sign function takes transaction data and combines it with a private key. The verification function then takes the data, signature, and public key as inputs and returns a Boolean output confirming the authenticity of the signature.

Sign Function: Message + Private Key ⟶ **Signature**

Verify Function: Message + Public Key + Signature ⟶ **True or False**

The majority of blockchains currently rely on elliptic curve cryptography (ECC) to prevent security breaches. More specifically, they use the ECDSA (Elliptic Curve Digital Signature Algorithm), as opposed to the RSA method, to process their digital signatures. Wallet addresses are essentially the hashed versions of the public keys generated through an elliptic curve.

It is assumed that quantum computers will be able to break conventional public-key cryptographic techniques like RSA and ECDSA. This is because these techniques are based on mathematical problems, which future quantum computers may be able to solve. RSA is based on the integer factorization problem, while the elliptic curve is based on the discrete logarithm problem.

NIST (National Institute of Standards and Technology) initiated a process to standardize a new public key cryptographic technique that can resist attacks from quantum computers.

NIST has selected four algorithms for standardization through the Post-Quantum Cryptography (PQC) standardization process. These include CRYSTALS-KYBER and three digital signature schemes: CRYSTALS-Dilithium, FALCON, and SPHINCS+.

This selection marks the completion of the third round of the PQC standardization process, which focuses on selecting public-key cryptographic algorithms to protect information in the era of quantum computers.

Cobe will initially use ECDSA for its digital signatures but will be built in such a way that the new standardized algorithm will seamlessly replace it when announced by NIST.

In addition, Cobe will still use the hashed version of the ECDSA public key for its addresses, but this will be mapped to an equivalent post-quantum algorithm for the purpose of digital signatures.

The above measures will ensure that Cobe is properly secured against future threats from quantum computers.

Cobe's Proof of Turn (PoT) Protocol – Security Considerations

Both Cobe's permissionless Concurrent Proof of Stake (CPoS) and permissioned Concurrent Proof of Authority (CPoA) chains utilize its novel 'Proof of Turn (PoT)' protocol. Proof of Turn (PoT) reduces the time required to process transactions by enabling advanced block scheduling. PoT includes a number of salient features that enhances the security of the protocol.

Key Security Considerations

- **Forkless Operation** PoT's advanced block scheduling enables forkless chain operation, which is more secure as it eliminates the risks associated with forks, such as double spending.
- **Early Scheduling:** Validators are determined through an early scheduling approach, utilizing synchronized random numbers and Cellular Automaton (rule 30), ensuring transparency and reducing the risk of forks.
- **Longest Chain Rule:** In case of a fork, the protocol adheres to the longest chain rule, which is a standard method in blockchain for validating the transaction history.
- **Slashing Mechanism:** PoT incorporates a slashing mechanism to penalize or remove dishonest nodes, thereby enforcing honest participation within the network.

The PoT protocol effectively mitigates against common blockchain attacks by its design and the implementation of additional measures that ensure the integrity and security of the blockchain. These security considerations make PoT a significant contribution to the field of blockchain protocols.

Adoption of Cobe's Blockchain: Five Distinct Competitive Advantages Over Alternative Chains

Cobe provides five unique advantages for dApp developers when they choose to build their cross-border trade applications on its chain, as opposed to the alternative options available. These are:

Dual Permissioned/Permissionless Architecture: As mentioned earlier, the needs of certain decentralized applications are best serviced with a permissioned chain (e.g., when a high degree of confidentiality is required) and others with a permissionless chain (e.g., when transparency and high participation are key).

Cobe's architecture offers both options to developers, with applications built on its permissioned Concurrent Proof of Authority chain working seamlessly with those built on its Concurrent Proof of Stake chain. No other blockchain offers this capability.

Dual Fixed and Variable Transaction Fee Options: Also described earlier, some cross-border trade applications should be built on a blockchain with fixed transaction fees if they are to eliminate uncertainty, which Cobe's CPoA chain provides. On the other hand, other applications are better on a chain with a variable fee structure, which is offered by Cobe's CPoS chain. No other blockchain provides this flexibility to developers of cross-border trade applications.

High Performance due to its Proprietary Proof of Turn (PoT) & Concurrency Protocols: As described earlier, Cobe has developed a novel consensus protocol coined 'Proof of Turn' (PoT) alongside its proprietary concurrency protocols. These protocols help to dramatically boost transaction speeds while lowering costs, enabling Cobe to deliver superior performance when compared to legacy blockchains.

Access to Nucleus Platform's User Base: Developers who build their applications on Cobe's blockchain will gain access to the user base of its Nucleus platform. This means they will gain instant access to a user base for their own cross-border trade application and scale faster. No other blockchain provides this for dApp developers.

Access to the Nucleus Platform's Cross Border Trade APIs: The Nucleus platform will launch a suite of cross-border trade APIs. These include smart escrow, DeFi, CeFI, product authentication, and provenance APIs, which dApp developers can integrate

seamlessly with their own cross-border trade applications. No other blockchain offers such APIs focused on cross-border trade to its dApp developers.

Blockchain Layer Advantages

Dual Permissioned-Permissionless Architecture

High Performance due to Proof of Turn & Concurrency Protocols

Application Layer Advantages

Access to Nucleus' User Base

Access to Cobe's Cross Border Trade APIs

Sonic: Cobe's Native Wallet

Cobe's dedicated wallet, Sonic, will work seamlessly to empower the entire Cobe ecosystem. Sonic will make it safe and easy to store, send, receive, stake, borrow, vote, and swap tokens on Cobe's blockchain through the following unique features: Seamless Cross-Border and P2P Transactions: Alongside P2P transactions, Sonic will make B2B cross-border transactions seamless. Users will be able to transact using Cobe's native tokens, fiat, bitcoin, ERC20 tokens, and all other major cryptocurrencies that meet the standards of Cobe's governance protocols.

Easy Borrowing: Sonic will be fully integrated with Cobe's DeFi and CeFi lending protocols, ensuring both easy and low-cost borrowing.

Staking on Cobe's Blockchain: Using their wallets, Sonic users will be able to seamlessly stake their CBE to generate revenue.

Built in DEX: Cobe's built-in DEX will allow users to safely swap Cobe and ERC20 tokens, as well as trade in all major cryptocurrencies and stable coins that have been approved by governance protocols.

Low Transaction Fees: Cobe's business model relies on the holistic growth of its ecosystem to generate value, rather than wallet fees, meaning that Sonic users will benefit from some of the lowest transaction fees available.

Web3 Support: Sonic users will be able to explore blockchain applications built on Cobe with ease.

Voting: Sonic users will be able to cast their votes on the governance of all aspects of Cobe's ecosystem.

Hardware Wallet Compatibility: Sonic will seamlessly integrate with all major hardware wallets, such as Ledger Nano and Trezor.

QR Codes: Sonic will support QR codes, facilitating the sending and receiving of payments.

Non-Custodial: Sonic's users will have full autonomy over their funds, and Cobe will never be able to access them.

Multi-Signature Wallet Support: Sonic will support multi-signature functionality, requiring multiple parties to authorize transactions, thereby enhancing security for corporate or group transactions.

Threshold Signature Schemes (TSS): This feature distributes trust among multiple parties, making digital signatures more secure and efficient, especially for DAOs within the Cobe ecosystem.

Post-Quantum Cryptographic Algorithms: To ensure long-term security against quantum computing threats, Sonic will be integrated with post-quantum cryptographic algorithms.

Sonic Wallet – Technology Stack

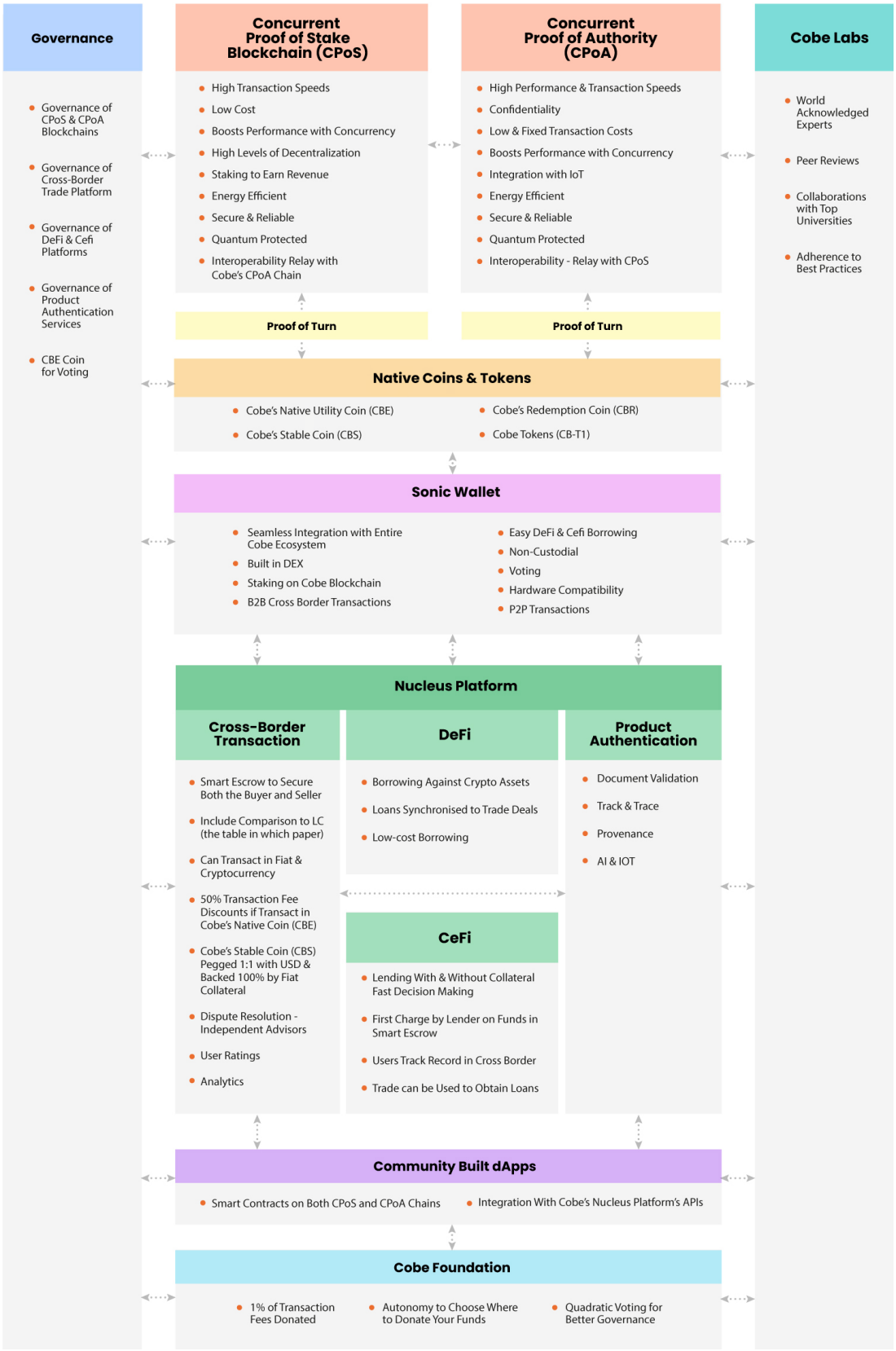
Layer	Features		
Presentation	Mobile Wallet, Desktop Wallet, Online Wallet, etc.		
Application /Service	Frontend and Backend Services APIs (Languages: React, Node, Solidity, Go)		
Database	NoSQL (MongoDB), SQL		
Coins/Tokens	Cobe Native Coin (CBE)	Cobe Stable Coin (CBS)	Cobe Redemption Coin (CBR-1)
	Cobe Native Token (CB-100)	Other Approved Coins & Tokens (e.g., BTC, ETH, ADA)	
Blockchain	Cobe's Native Blockchain, Consensus (CPoS, CPoA)		
Infrastructure	Network, Compute and Storage (Cloud Services: Amazon Web Services, Google Cloud, etc.)		

Cobe's Ecosystems Coin Stack

Below is a summary of the different coins and tokens that are part of Cobe's ecosystem. Each one has been discussed in detail in the relevant sections of the paper, which can be referred to for more information.

Name	Description
CBE	Cobe's primary coin. It can be used for staking on Cobe's blockchain and across the Nucleus platform to receive a fee discount. Voters must hold CBE to take part in governance voting on both Cobe's blockchain and the Nucleus platform.
CBS	This is Cobe's collaterally backed stable coin, which will be pegged at a 1:1 ratio with the USD.
CBR-1	Cobe's non-fungible redemption coin. This coin can be used on the Nucleus platform to keep a ledger of funds owed to each user from those held in its smart escrow vaults.
CB-100	Cobe's native fungible token, which can be used by dApp developers to create their own applications and currencies on Cobe's blockchain.

Cobe's Ecosystem



Cobe Labs

Peer Reviews

World Acknowledged Experts

Collaborations With Top Universities

Adherence To Best Practices

Blockchain technology is evolving rapidly, with innovative new solutions being continuously proposed. Distributed ledgers and blockchain are undoubtedly some of the most hyped technologies in recent history, demonstrating the current need for sound and informed analysis.

However, despite the great advantages blockchain has to offer, many projects have failed due to weak technological foundations.

Cobe believes that this is the result of both a lack of experimentation and divergence from the proper scientific method.

That is why Cobe Labs has been established, a platform where its research results will be published for peer review and knowledge sharing with the blockchain community.

Cobe's works will be submitted to top conferences and journals to gain insights from the academic world and to guarantee maximum adherence to scientific and technical principles.

Cobe uses both empirical and theoretical approaches in its research, which is motivated by practical problems and the underlying theory.

Blockchain technology is impacting multiple aspects of our world, which is why Cobe Labs includes some of the best minds from the fields of computer science, software engineering, mathematics, game theory, data science, economics, AI, and the behavioral sciences.

In addition to collaborating with world-renowned universities, Cobe's team includes leading academics and practitioners from different disciplines who are working together to accelerate innovation. Our research projects solve specific problems where distributed ledgers and blockchain technologies are the focus, based on solid research methods and technical knowledge.

Collaborations with World-Renowned Academic Institutions

To ensure that Cobe continues to pioneer ground-breaking innovations in cross-border trade and the blockchain space, with all technologies tested rigorously and transparently, it has officially collaborated with the following world-renowned academic institutions:

University College London

Brunel University London

Royal Holloway College

Università Ca'Foscari Venezia

University of Cagliari

University of Pennsylvania

Roadmap

2024

Q1
- Proof Of Concept
- Product Validation
- Exec Alignment

Q2
- Seed Funding Confirmation
- Team Recruitment
- Research and Development

Q3
- Cobe Labs Launched
- Partnerships With Academic Institutions

Q4
- Blockchain Architecture Development

2025

Q1
- Blockchain Development Commences
- Nucleus Architecture Development

Q2
- Research Papers Published for Peer Review
- Continuation of Software Development

Q3
- White Paper v1 Published
- Yellow Paper v1 Published
- Token Launch

Q4
- Token Listing
- Cobe Wallet Launch
- Cross Border Trade Platform Real Time Testing

2026

Q1
- Concurrent DPoS Blockchain v1 Launch
- Cross Border Trade Platform v1 Launch in USA/ Europe/Asia
- DeFi Yellow Paper Published
- Ecosystem Governance v1 Launch

Q2
- DeFi Platform v1 Launched
- Provenance Yellow Paper Published

Q3
- Concurrent DPoS Blockchain v2 Launch

Q4
- PoA Blockchain for Provenance v1 Launch
- Provenance Platform v1 Launch
- Regional Expansion (Stage-2)

2027

Q1
- Launch of Concurrent DPoS Blockchain v3
- Launch of PoA Blockchain v2
- Enabling Smart Contracts

Q2
- CeFi Launch
- Grant Distribution

Q3
- Regional Expansion (Stage-3)

Q4
- Launch Cobe Foundation
- Launch DeFi v2
- Provenance Platform v2 Launch

2028

Q1
- Regional Expansion (Stage-4)
- Provenance Platform v3

Q2
- Continue Region Expansion (Stage-5)

Q3
- Provenance Platform v3 Launch - IOT Integration

Q4
- DeFi v3 Launch
- AI Integration into Ecosystem v1

The Cobe Team

Executive Team

Dr Michael Singh

Chief Executive

By harnessing the power of blockchain technology, Michael's mission is to make cross-border trade accessible to all.

Prof. Marco Ortu

Chief Technology Officer

Backed by decades of experience in both software engineering and academia, Professor Ortu is well positioned to lead the development of Cobe's technologies.

Ibrahim Al Dubaili

Chief Operating Officer

Ibrahim, a diligent and experienced executive, is responsible for overseeing Cobe s operations, ensuring it remains on track to achieve its mission.

Prof. Michele Marchesi

Chief Scientific Officer

As one of the world's leading computer scientists, Professor Marcheshi is leading Cobe's research and development.

Prof. Roberto Tonelli

Chief Information Officer

With a wealth of experience in building complex systems, Professor Tonelli is overseeing the development of Cobe's blockchain infrastructure.

Chris Ash

Chief Financial Officer

As a seasoned veteran of corporate and trade finance, with over 30 years' experience in the sector, Chris brings unmatched insight to Cobe.

Niall Mason

Chief Strategy Officer

With the unique combination of over 20 years' experience in both cross-border trade and software engineering, Niall is ideally positioned to lead Cobe's strategy.

John Lee

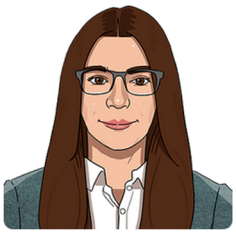
Chief Marketing Officer

With a proven track-record in delivering highly successful digital campaigns for some of the world's best-known brands, John is leading Cobe's marketing strategy.

Core Team

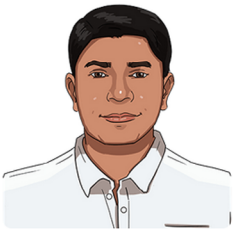
Prof. Simone Righi
Financial Modelling

Prof. M Kassab
Researcher



Dr Rumyana Neykova
Researcher

Dr Julien Lange
Researcher



Zubair Burioro
Software Engineering & Application Security

Muhammad Maaz
Senior Software Engineer & Data Scientist

Dr Giuseppe Stefanis
Researcher

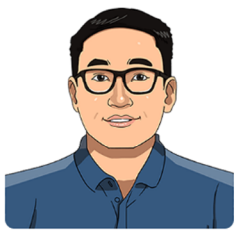
Dr Lodovica Marchesi
Blockchain R&D

Dr Anjum Nazir
Blockchain R&D & Security

Dr Jamshed Memon
Senior Cryptographer

Aatir Farooqui
Senior Software Engineer

Tabraiz Anwer
Senior Blockchain Engineer



Si Xiang Seow
Senior Software Engineer

Abdul Moiz
Full Stack Developer

Abdul Ahad
Full Stack Developer

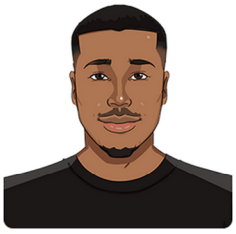
Tauqeer Bilal
Full Stack Developer

Marcel Ooms
Front End Developer

Federico Mercante
UX Designer

Marcos Medel
UI Designer

Leon Lau
UX & Graphic Design



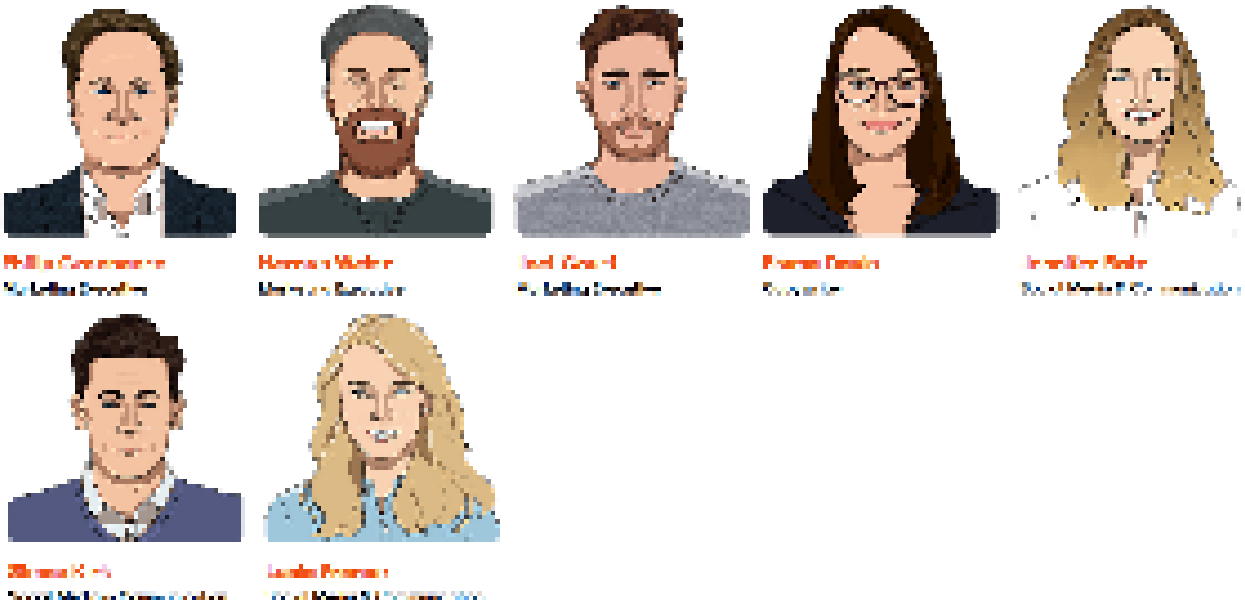
Daniel Jarett
Graphic Designer

Santosh Kumar
Financial Controller

Lucila Riggio
Project Manager

Julia Franucci
Project Manager

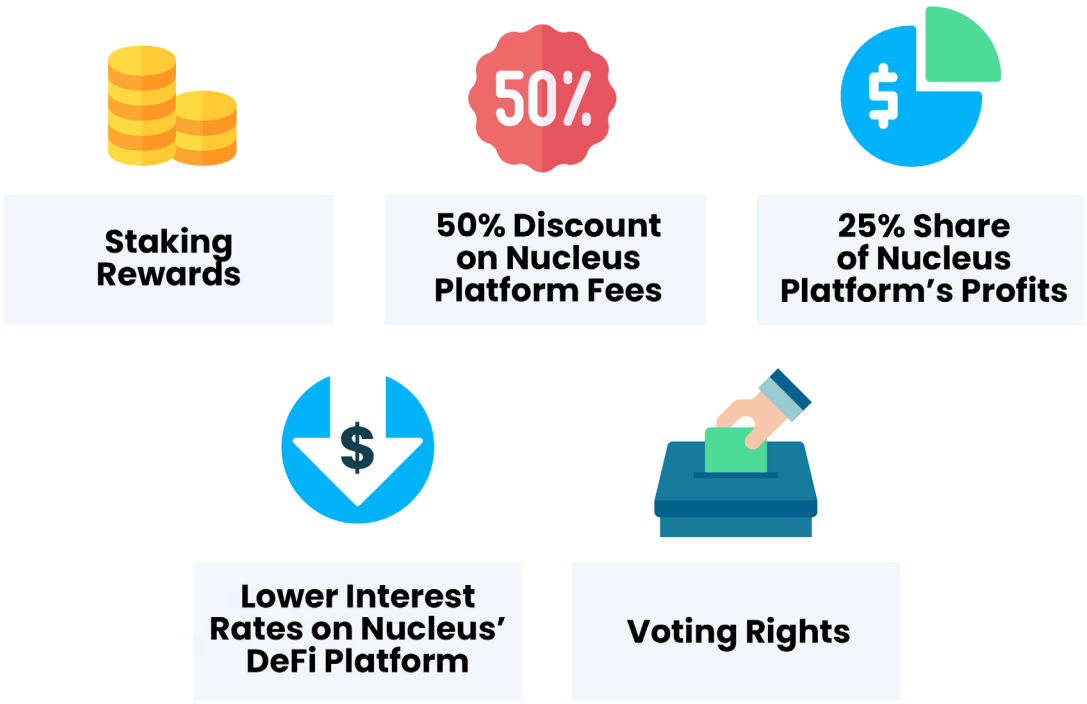
Ryan Goodge
Creative Director



Tokenomics

Cobe Native Coin (CBE): Utility & Value Creation

As adoption of Cobe's ecosystem grows, so too will the demand and value of its native coin (CBE). Below is an outline of the unique benefits that CBE will offer:



CPoS Chain Staking Rewards: Holders of CBE will have the opportunity to earn revenue by staking their coins on its Concurrent Proof of Stake (CPoS) blockchain.

CPoA Chain Staking Rewards: Only master nodes are permitted to become validators on Cobe's CPoA chain and earn the associated staking rewards. This requires a node to submit a minimum of 350,000 CBE with Cobe's treasury, increasing demand for the coin.

50% Discount on Fees on the Nucleus Platform: Users will be rewarded with a 50% discount in Nucleus's service fees should they pay them using CBE as opposed to fiat or other cryptocurrencies.

25% Profit Share of the Nucleus Platforms Profits: 25% of the profits generated by the Nucleus platform will be distributed to holders of CBE.

Lower DeFi Interest Rates on the Nucleus Platform: Users will receive discounted

DeFi interest rates on their borrowing if they place up to 2.5% of their collateral as CBE. See page 36 to learn more.

Voting Rights: Holders of CBE will have voting rights on Cobe's Concurrent Proof of Stake (CPoS) blockchain and its Nucleus platform proportional to the number of coins that they hold.

Token Metrics

Ticker: Cobe
Total Supply: 1,000,000,000
Fundraising Hard Cap (13%): 130,000,000

Token Sale

Token Sale	Token Amount (CBE)	%	Price	Total
Seed	60,000,000	6%	$0.06	$3,500,000
Private	50,000,000	5%	$0.20	$10,000,000
IEO	20,000,000	2%	$0.30	$5,000,000
Total	**130,000,000**	**13%**		**$18,500,000**

Seed Capital From Project Founders

To demonstrate their confidence in its success, Cobe's founders have invested $3,500,000 from their personal funds as seed capital into the project, in exchange for 6% of the CBE tokens (60,000,000 CBE).

Private and Public Fundraising

There will be a total supply of 1,000,000,000 CBE tokens, with 13% being sold through a private and public fundraiser to raise the capital required to build out Cobe's cross border trade ecosystem. This includes delivering Cobe's Concurrent CPoS and CPoA blockchains alongside its Nucleus platform.

Private Sale (5%):

Soft Cap: $8 million
Hard Cap: $10 million
Token Amount: 50,000,000

IEO (2%)

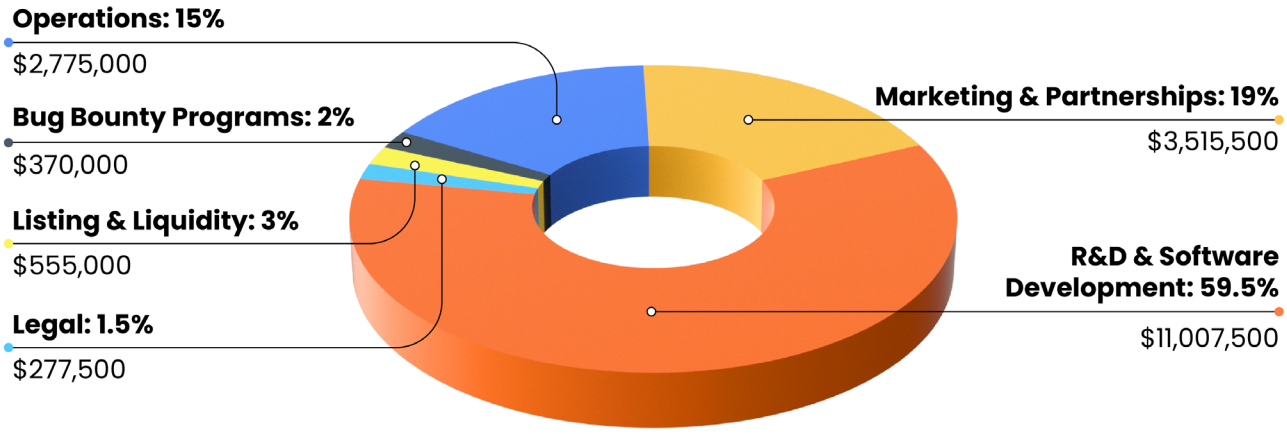
Soft Cap: $4 million
Hard Cap: $6 million
Token Amount: 20,000,000

Vesting Periods

	Tokens	Percent	Price	Release Upfront	Unlock Time Start	Monthly Release Amount
Seed	60,000,000	6%	$0.06	5%	1 Month	10%
Private	50,000,000	5%	$0.20	5%	1 Month	10%
IEO	20,000,000	2%	$0.30	5%	1 Month	25%

Budget Allocation

Below is a breakdown of how the funds from the token sale will be spent:



Use of Funds	Amount	%
R&D & Software Development	$11,007,500	59.5%
Marketing & Partnerships	$3,515,500	19%
Operations	$2,775,000	15%
Listing & Liquidity	$555,000	3%
Bug Bounty Programs	$370,000	2%
Legal	$277,500	1.5%
Total	**$18,500,000**	**100%**

R&D & Software Development (59.5%): Alongside development of its Nucleus platform, the budget will include development of Cobe's native Concurrent CPoS and PoA blockchains.

Marketing & Partnerships (19%): Alongside securing high quality partnerships in the cross-border trade sector, Cobe will execute influencer and digital marketing campaigns to raise brand awareness and grow its ecosystem.

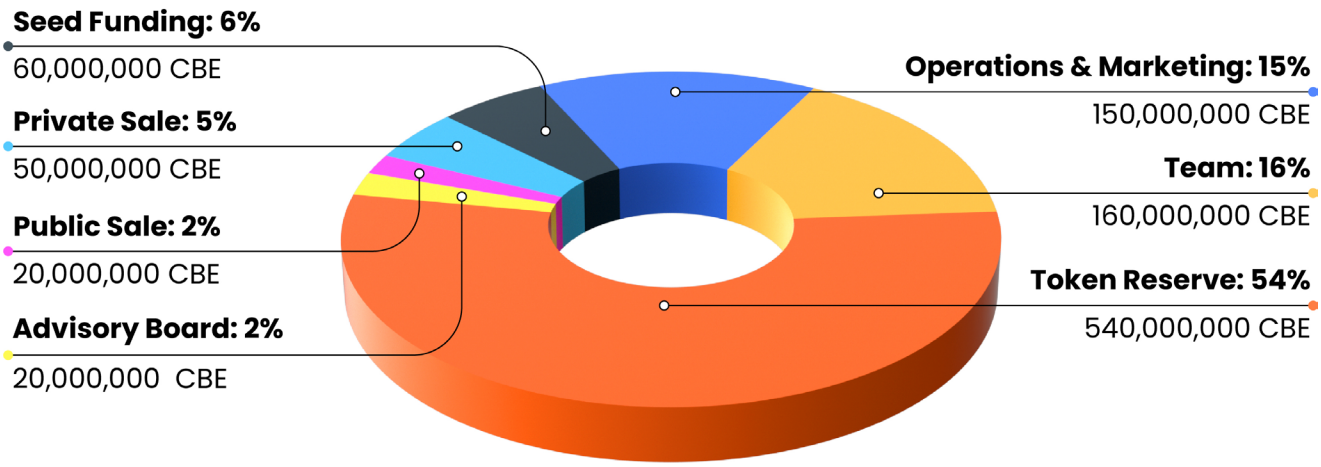
Operations (15%): By running a lean, cost-effective operation, Cobe will invest the majority of the project funds into delivering high quality solutions, marketing, and securing valuable partnerships – maximizing growth.

Bounty Programs (2%): Although Cobe has a strong team of software developers and all new products will be independently audited by leading cybersecurity firms, we understand the value our community can add in building a flawless ecosystem.

Listings & Liquidity (3%): Cobe will partner with leading exchanges to ensure easy access and strong growth of CBE.

Legal (1.5%): Cobe has engaged with some of the best legal teams, including X and Y, to ensure that Cobe's ecosystem is built on a solid legal foundation.

Token Distribution: Remaining 870,000,0000 (87%) Reserves



Token Reserve: 540,000,000 (54%) – Locked with a vesting period of 84 months with 25% of the locked supply being released every 12 months for the first 24 months, followed by 20% of the remaining supply being released every 12 months for the remaining 60 months. Token reserves will be used for future initiatives including software development, R&D, partnerships, and grants to enable Cobe's ecosystem to eventually become self-sustaining.

Team: 160,000,000 (16%) – Vesting period of 36 months, with 33.33% being released every 12 months.

Advisory Board: 20,000,000 (2%) – Vesting period of 42 months, with 14.28% released every 6 months.

Operations & Marketing: 150,000,000 (15%) – Vesting period of 60 months, with 20% released every 12 months.

Nucleus Platform's Revenue Distribution

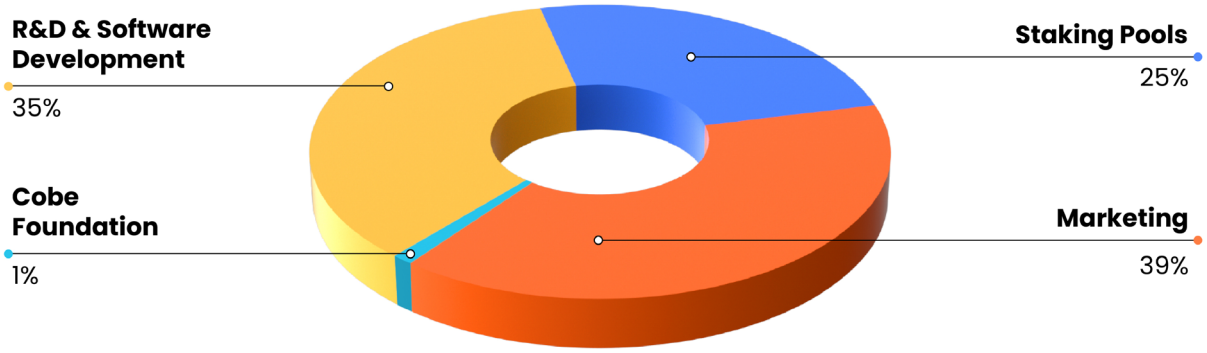
The gross margins generated by the Nucleus platform will be invested as follows:

R&D & Software Development: 35%

Marketing: 39%

Staking Pools: 25% of Nucleus's gross margin will be transferred to Cobe's staking pools to be distributed to CBE coin holders.

Cobe Foundation: 1% of Nucleus's gross margin will be donated to charitable organizations focused on empowering underprivileged individuals and communities to create business opportunities and become self-sustainable.



Risks to Participating in the Token Sale

Although we are optimistic about Cobe's prospects, participants in the token sale should keep in mind potential risks of participation as shown in the Token Sale Terms & Conditions.

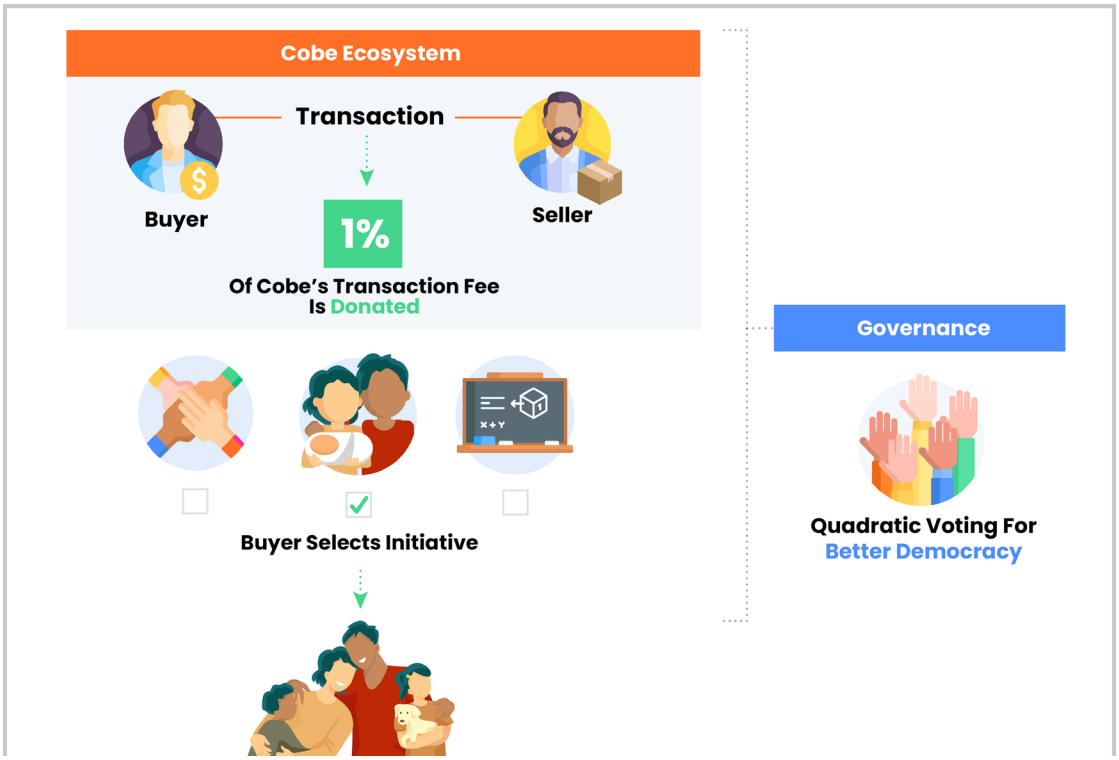
Cobe Foundation

Many regions of the world suffer from high levels of corruption and poor financial and legal infrastructure. This, coupled with the unnecessary complications of cross-border trade, results in millions of people being excluded from the global economy through no fault of their own.

Cobe believes that everyone should have access to global trade. By removing reliance on centralized institutions, Cobe will empower those currently excluded with greater access to funding and reduced trading costs. The lives and living standards of vulnerable communities will significantly improve should cross-border trade be more readily available.

Cobe's foundation will donate 1% of the Nucleus platform's gross margin to humanitarian initiatives, particularly those that seek to level the playing field and make the global economy accessible to people from underprivileged backgrounds.

The foundation is something that everyone in the Cobe community can be proud of. To enable the highest levels of integrity and participation, Cobe will ensure that CBE coin holders are able to participate in the governance of the foundation actively and fairly. It will limit the possibility of a few individuals having too much control over the foundation by building its governance around a decentralized quadratic protocol. On top of this, users of the Nucleus platform will have autonomy in deciding which philanthropic cause will receive the 1% donations associated with their transaction.



References:

1. Methods of payment in international trade business? (2021, October 21). www.linkedin.com; Virafruits.
2. https://www.linkedin.com/pulse/methods-payment-international-trade-busin ess-virafruits/
3. Alavi, H. (2017). Risk analysis in documentary letter of credit operation. Research Gate. https://www.researchgate.net/publication/316244566_Risk_Analysis_in_D ocumentary_Letter_of_Credit_Operation
4. Sibanda, K., Hove-Sibanda, P., & Shava, H. (2018). The impact of SME access to finance and performance on exporting behaviour at firm level: A case of furniture manufacturing SMEs in Zimbabwe. Acta Commercii, 18(1). https://doi.org/10.4102/ac.v18i1.554
5. Cockerham, R., Markets, C. C., January 28, C. F. | U., & 2019. (2019, January 28). What Is the Fee for a Letter of Credit? Finance - Zacks. https://finance.zacks.com/fee-letter-credit-10533.html
6. Letter of credit fees. (n.d.). Www.creditmanagementworld.com. http://www.creditmanagementworld.com/letterofcredit/lcinternationallocfee s.html
7. Bloomberg - Trade Finance Market Size is Projected to Reach USD 10426.67 Billion by 2026 at CAGR 5.37% | Valuates Reports. (2021, February 8). www.bloomberg.com.
8. https://www.bloomberg.com/press-releases/2021-02-08/trade-finance-mar ket-size-is-projected-to-reach-usd-10426-67-billion-by-2026-at-cagr-5-37-v aluates-reports
9. World Trade Organization. (2017). Trade finance and SMEs Bridging the gaps in provision. https://www.wto.org/english/res_e/booksp_e/tradefinsme_e.pdf
10. The World Bank. (2021). SME Finance. World Bank. https://www.worldbank.org/en/topic/smefinance
11. Unicsoft. (n.d.). Combating counterfeit & creating trust through the whole supply chain. Unicsoft. Retrieved March 24, 2022, from https://unicsoft.com/portfolio/blockchain-based-track-trace-system/
12. Wood, L. (2018, May 15). Global Brand Counterfeiting Report 2018-2020 - ResearchAndMarkets.com. Www.businesswire.com.
13. https://www.businesswire.com/news/home/20180515005775/en/Global-Brand-Counterfeiting-Report-2018-2020---ResearchAndMarkets.com
14. Overstreet, K. (2019, November 26). $200 Billion Pharma Counterfeit Drug Market Growing by 20% Per Year. Healthcare Packaging. https://www.healthcarepackaging.com/issues/traceability-serialization/article/21102806/200-billion-pharma-counterfeit-drug-market-growing-by-20-

per-year

15. Anonym. (2022, March 24). Fraud and deception with organic food, 68 companies suspected | tellerreport.com. Www.tellerreport.com. https://www.tellerreport.com/business/2019-08-10---fraud-and-deception-w ith-organic-food--68-companies-suspected-.H1j-c-37H.html

16. Siegner, C. (2018, April 12). Maker of Bertolli olive oil settles class-action lawsuit for $7M. Food Dive.

17. https://www.fooddive.com/news/maker-of-bertolli-olive-oil-settles-class-acti on-lawsuit-for-7m/521140/

18. United Nations. (2017, November 29). One in 10 medicines in developing countries substandard or falsified – UN health agency. UN News. https://news.un.org/en/story/2017/11/637781-one-10-medicines-developin g-countries-substandard-or-falsified-un-health-agency

19. Boisseau, A. (2021, June 24). Dairy plants seek sustainability solutions. www.dairyfoods.com.

20. https://www.dairyfoods.com/articles/95085-dairy-plants-seek-sustainability- solutions

21. World Customs Organization. (2018, June). Guidelines on Certification of Origin.

22. http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/key-issues/rev enue-package/guidelines-on-certification.pdf?db=web

23. Rogerson, M., & Parry, G. (n.d.). Blockchain: case studies in food supply chain visibility. Emerald Insight. https://www.emerald.com/insight/content/doi/10.1108/SCM-08-2019-0300/f ull/html

24. Dragoni et al. (2020). On the benefits and challenges of blockchains for managing food supply chain. Wiley Online Library. https://onlinelibrary.wiley.com/doi/abs/10.1002/jsfa.10883?af=R

Disclaimer:

This document is a technical white paper that presents the current status and future plans for Cobe. The sole purpose of this document is to provide information and is not to provide a precise description on future plans. Unless explicitly stated otherwise, the products and innovative technologies organized in this document are still under development and are yet to be incorporated. Cobe does not provide a statement of quality assurance or affidavit for the successful development or execution of any of such technologies, innovations, or activities described in this document. Also, within legally permitted scope, Cobe rejects any liability for quality assurance that is implied by technology or any other methods. No one possesses the right to trust any contents of this document or subsequent inference, and the same applies to any of the mutual interactions between Cobe's technological interactions that are outlined in this document. Notwithstanding any mistake, default, or negligence, Cobe does not have legal liability on losses or damages that occur because of errors, negligence, or other acts of an individual or groups in relation to this document.

Although information included in this publication has been referred from data sources that were deemed to be trusted and reliable by Cobe, Cobe does not write any statement of quality assurance, confirmation, or affidavit regarding the accuracy, completeness, and appropriateness of such information. You may not rely on such information, grant rights, or provide solutions to yourself, your employee, creditor, mortgagee, other shareholder, or any other person. Views presented herein indicate current evaluation by the writer of this document and are not necessarily representative of the views of Cobe. Views reflected herein may change without notice, and do not necessarily comply with the views of Cobe. Cobe does not have the obligation to amend, modify, and renew this document, and it is not obliged to make notice to its subscribers and recipients if any views, predictions, forecasts, or assumptions in this document change, or any errors arise in the future. Cobe, its officers, employees, contractors, and representatives do not have any responsibility or liability to any person or recipient (whether by reason of negligence, negligent misstatement, or otherwise) arising from any statement, opinion, or information, expressed or implied, arising out of, contained in, derived from, or omitted from this document. Neither Cobe nor its advisors have independently verified any of the information, including the forecasts, prospects, and projections contained in this document.

Each recipient is to rely solely on its own knowledge, investigation, judgement, and assessment of the matters that are the subject of this report and any information that is made available in connection with any further investigations and to satisfy him/herself as to the accuracy and completeness of such matters. While every effort has been made to ensure that statements of facts made in this paper are accurate, and that all estimates, projections, forecasts, prospects, and expression of opinions and other subjective judgments contained in this document are based on the

projection that they are reasonable at the time of writing, this document must not be construed as a representation that the matters referred to therein will occur. Any plans, projections, or forecasts mentioned in this document may not be achieved due to multiple risk factors, including limitation defects in technology developments, initiatives or enforcement of legal regulations, market volatility, sector volatility, corporate actions, or the unavailability of complete and accurate information.

Cobe may provide hyperlinks to websites of entities mentioned in this paper, but the inclusion of a link does not imply that Cobe endorses, recommends, or approves any material on the linked page or accessible from it. Such linked websites are accessed entirely at your own risk. Cobe accepts no responsibility whatsoever for any such material, or for consequences of its use.

This document is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any state, country, or other jurisdiction where such distribution, publication, availability, or use would be contrary to law or regulation.

This document is only available on www.cobe.network and may not be redistributed, reproduced, or passed on to any other person or published, in part or in whole, for any purpose, without the prior, written consent of Cobe. The manner of distributing this document may be restricted by law or regulation in certain countries. Persons into whose possession this document may come are required to inform themselves about, and to observe such restrictions. By accessing this document, a recipient hereof agrees to be bound by the foregoing limitations. This white paper is an information paper subject to update pending final regulatory review. This paper does not constitute an offer. Any such offer will be subject to final regulatory review and governed by a revised paper and conditions of sale document that will prevail in the event of any inconsistency with the paper set out below. Accordingly, any eventual decision to buy Cobe tokens must only be made following receipt of the final paper, and tokens cannot be purchased until the final paper has been issued by Cobe when all final regulatory requirements have been satisfied.

This paper is not a prospectus, product disclosure statement, or other regulated offer document. It has not been endorsed by, or registered with, any governmental authority or regulator. The distribution and use of this paper, including any related advertisement or marketing material, and the eventual sale of tokens, may be restricted by law in certain jurisdictions, and potential purchasers of tokens must inform themselves about those laws and observe any such restrictions. If you come into possession of this paper, you should seek advice on, and observe any such restrictions relevant to your jurisdiction, including without limitation the applicable restrictions set out in the Regulators' Statements on Initial Coin Offerings at the website of the International Organization of Securities Commissions ('IOSCO') (https://www.iosco. org/publications/?subsection=ico-statements). Restrictions are subject to rapid change. If you fail to comply with such restrictions, that failure may constitute a violation of applicable law. By accessing this paper, you agree to be bound by this requirement.