

Project-X

Technical White Paper

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Introduction

Project-X Mission is to

- Interconnect decentralised ecosystems and organisations
- Blockchain ledger platform with a focus on interoperability, speed and privacy

Blockchains have demonstrated great promise of utility over several fields including “Internet of Things” (IoT), finance, governance, identity management, web- decentralisation and asset-tracking. However, despite the technological promise and grand talk, we have yet to see significant real-world deployment of present technology. We believe that this is down to five key failures of present technology stacks:

Scalability: How much resources are spent globally on processing, bandwidth and storage for the system to process a single transaction and how many transactions can be reasonably processed under peak conditions?

Isolability: Can the divergent needs of multiple parties and applications be addressed to a near-optimal degree under the same framework?

Developability: How well do the tools work? Do the APIs address the developers’ needs? Are educational materials available? Are the right integrations there?

Governance: Can the network remain flexible to evolve and adapt over time? Can decisions be made with sufficient inclusivity, legitimacy and transparency to provide effective leadership of a decentralised system?

Applicability: Does the technology actually address a burning need on its own? Is other “middleware” required in order to bridge the gap to actual applications?

Project-X is the foundation for a new era of crypto-finance applications. Driving value by connecting the fragmented blockchain ecosystem with traditional financial applications. Project-X leverages the building blocks and concepts from the Internet of Value, Web 3.0, Blockchain 2.0 to create Finance 3.0.

Project-X is a decentralized, open-sourced, blockchain protocol optimized for high transaction volumes and real time settlement which allows interoperability built with low fixed transaction fees and based on highly scalable DPoS consensus and offering multi-chain capabilities leveraging key standards being implemented as part of Polkadot.

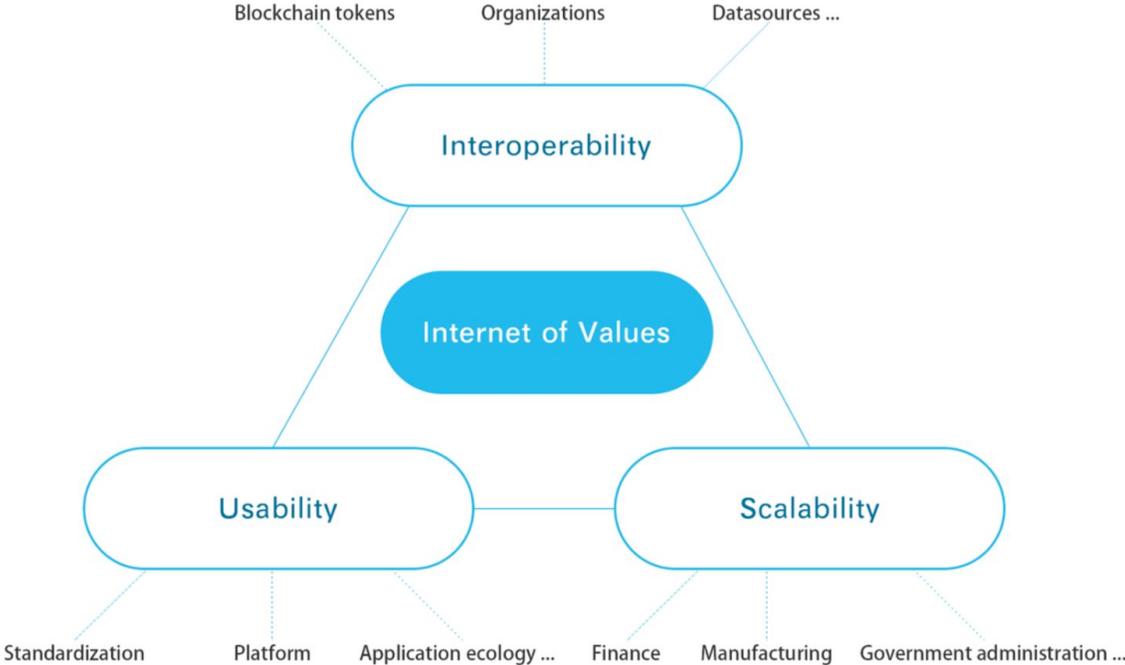


Figure 1. Characteristics of IoV

Protocol Implementation and Network

Previous Work

Bitcoin [1] led the way in the creation of numerous alternative currency platforms as the first generation of blockchain technology. Bitcoin's natural use case was currencies and it excelled at this, however it suffered from speed, scalability and privacy issues also governance and upgrades were difficult causing a number of forks [2]. Key reasons include the Proof Of Work Consensus algorithm [3] which whilst allowing for decentralization requires all miners to agree on the state of the chain which has the effect of taking an average of 10 minutes to process a block. Privacy was a concern for some parties and hence alternate blockchains such as Monero [4] and ZCASH [5] arose. Data storage is expensive on the platform and as such improvements such as Segregated witness [6] were introduced. Finally scalability and cost of transactions drove initiatives such as lightning [7] allowing micro payments to be processed via a network of channels (chains).

Ethereum [8] introduced the ability to build application-specific logic upon a blockchain network. This enabled new capabilities beyond transactions to incorporate state, business logic, and multi-party contracts to be stored and executed on a blockchain and written to an immutable ledger. Ethereum also utilizes Proof of Work and as such suffers from similar scalability issues as bitcoin, albeit to a lesser extent with block times taking an average of 10 seconds rather than 10 minutes. Currently there are a number of initiatives going on to improve ethereum's performance and scalability including Casper [9] which moves Ethereum towards a proof of stake consensus algorithm, Sharding [10][11][12] which allows for scalability through shard chains and collations and plasma[12] which introduces micropayment channels similar to lightning.

Speed and Scalability challenges lead to the introduction of more chains the majority of which are using a version of Proof of Stake these include Tendermint[14] and EOS[15].

Enterprise use cases introduced the concept of private permissioned chains, the focus of these are usually sharing information using Distributed Ledger Technology (DLT) and less so on decentralization. Enterprise use cases introduce additional concerns around privacy, permissioning and endorsement of transactions which in turn lead to concepts as channels allowing different participants to subscribe to different ledgers, access control lists designating who can see what on the ledger and endorsement policies which allow for detailed rule based permissioning as to who must endorse these transactions. Key offerings in this area include

Enterprise Ethereum Alliance [16], Hyperledger Fabric [17], Chain [18] and Digital Asset [19] with the last two offering a blockchain Platform As A Service targeted towards Enterprise users. Also ICON [22] is a Korean based organization is offering a full portfolio including a multi-channel blockchain, Blockchain Transmission Protocol, De-centralized exchange, Public Channel (similar to a mainnet), Governance and a Portal.

Payment Platforms integrating blockchain technology with traditional financial institutions are also on the rise these include Stellar [20] and Ripple [21], Wanchain, Orchid.

Cross-Chain Platforms - As you can see from the evolution of chain technology and the myriad of blockchain offerings. The ecosystem is at a point where Cross Chain Platforms are now becoming a necessity to allow value transfer across these siloed offerings. This area is still relatively in its infancy with platforms typically in the proposal or design stage. Following are three of the leaders in this space.

Cosmos [23] [24] are leveraging Tendermint[14] for their blockchain offering and have built out an Application Blockchain Interface (ABCI) and Inter Blockchain Communication (IBC) designed to allow disparate chains a standardized communication and messaging system. However, according to the Polka Dot white paper [25] *'This interchain communication is limited to the transfer of digital assets ("specifically about tokens") rather than arbitrary information, however such interchain communication does have a return path for data, e.g. to report to the sender on the status of the transfer.*

Polkadot [25] is a *'heterogeneous multi-chain protocol with the potential to be backwards compatible to certain, pre-existing blockchain networks.'* The protocol offering offers capabilities around sharing trust providers and reducing cost of trust for Blockchains moving forward. It is currently under development and was proposed by Gavin Wood who also founded <https://www.parity.io/>.

The above Platforms and protocols are likely to ultimately co-exist under mutually beneficial relationships for the foreseeable future.

Project-X differs in many ways from the above Cross-Chain platforms. As Project-X mission is to Interconnect decentralised ecosystems and organisations with a focus on interoperability, speed and privacy. It will need to come up with a comprehensive solution which can co-exist, leverage and extend capabilities and offerings from all of the above offerings.

	XBC Blockchain	XBI Interledger	XDC Developer Centre	XOO Off Chain Orchestration	XMW Multi-wallet	XCT Chain Tools	XBT Business Tools
Project-X							
Bitcoin	Currency						
Ethereum	Currency						
EOS	DPOS						
Tendermint	DPOS						
Enterprise Ethereum	ERP						
Hyperledger Fabric	ERP						
ICON	ERP						
Digital Asset	PAAS						
Chain	PAAS						
WanChain							
Stellar							
Ripple							
Cosmos							
Polkadot							
Quant							
Block Collider				Finance			
OneLedger		ABCI Consensus					
IRIS							
MetaMask							

The Philosophy of Project-X

Project-X Mission

- Interconnect decentralised ecosystems ~~and organisations~~
- Interconnect and scale across public permissionless and private permissioned blockchains
- Focus on interoperability, speed ~~and privacy~~

A key driver for value is usability or liquidity. That is being able to exchange value quickly and efficiently across a large audience and have the value be fungible against other assets. Blockchain thus far has done a wonderful job of decentralization specifically around the use case of currency and fundraising. As we move forward and the ecosystem grows gaining more users, more digital assets, more use cases and more chain offerings below are some of the key challenges that must be addressed.

Scalability : Blockchain offerings have traditionally had limited bandwidth and long transaction times this is due to a number of reasons but decentralization and distributed trust are key factors.

Interoperability : Blockchain offerings have traditionally been siloed. Each appealing to a specific vertical. As the ecosystem grows the blockchain ecosystem is becoming fragmented.

Cost of Trust : Blockchain offerings have traditionally had a high cost of trust which has risen as the economic value of the Tokens on the chain have increased. This is primarily due to two main factors both relating to the Consensus algorithm. For example a Proof of Work Consensus algorithm is expensive computationally also it relies on a large set of nodes to validate the chain.

Asset Fragmentation : Blockchain governance is still evolving, early offerings were seen as monolithic platforms without the ability for all stakeholders to agree on the future direction of the platform and move in that direction. This has lead to “hard-forks” for both Ethereum (Ethereum-classic) and Bitcoin (Bitcoin cash). When this happens parallel chains are spun up thus Fragmenting the Asset offerings on these platforms. Also the lack of extensibility of these platforms has given to the rise of many vertically focused chains with different Assets. reducing fungibility and liquidity of the Assets on these siloed chains.

Self Governance : As mentioned above Blockchain governance is still evolving, with traditional offerings placing limited tools around the incentivization of Trust Providers. As the blockchain ecosystem evolves and we moved towards decentralization not only within one chain but across chains a number of new governance tools need to evolve. These are currently being worked on

and include the following Trust Providers incentivization, Token Governance, Risk Management Governance and many more.

Financial Tools : Financial Tools for blockchain are rapidly evolving. The first widely adopted use case was that of digital currency by bitcoin. This was followed by Ethereum with its Smart Contract Layer which brought the ability for organization to define their own currency via the ERC-20 standards which in turn lead to the raising of capital using these currencies making ethereum a leading player in Initial Coin Offerings (ICO's). We are now seeing the ability for Blockchain to be leveraged for a multitude of use cases and the Financial Tools need to evolve to support these. Key examples of this are stable-coins addressing price instability and offering a toolset to set risk profiles to drive the adoption and security of the coins. Other tools which are following include Digital Assets (supporting the shift of existing trading platforms onto blockchain) as well as Trading Algorithms, Staking and Funding Tools just to name a few.

Digital Rights Management : Blockchain has done a wonderful job of securing digital rights of assets via cryptography. The first use case once again being for currency on a siloed chain. As the ecosystem evolves a new era of digital rights management needs to accompany the evolution. This needs to address cross-chain identification verification and sharing rights to digital assets across chain to facilitate higher fungibility. Other key areas where digital rights will evolve around include allowance capabilities, liquidity management and collateral debt positions.

Blockchain Development Complexity : Blockchain offers right capabilities but developing decentralized apps on these platforms have brought with it considerable complexity. Following are some of the key challenges which are being improved upon. Development Infrastructure costs, Limited and evolving Smart Contract programming Languages, Integration capabilities both with other chains and off-chain systems and broader tool sets such as Analytics, compliance and audit capabilities.

Mainstream Ecosystem Integration : Until now blockchains have been very effective securing transactions on chain. As blockchain becomes ubiquitous and integration with mainstream systems become commonplace more robust integration capabilities will be required. We have already seen the extensive use of Oracles as data sources that may be leveraged by smart contracts. As we move forward other key building blocks include workflow capabilities around business process execution across platforms, trusted off chain execution, transaction atomicity across both chain and traditional systems.

End User Adoption : Whilst blockchain adoption has been increasing at a phenomenal pace there are still additional barriers preventing mainstream adoption. Indeed the majority of users are currently tech-savvy millennials many of which work in the crypto space or users of Centralized exchanges who provide a level of comfort and security for casual users at the cost though of centralization. For end users trying to work natively with some of the challenges

include disparate practices for each chain, lack of multi-currency wallets, non-readable addresses, lack of key recovery capabilities. Finally loss of funds due to losing keys or sending funds to invalid addresses make many users reluctant to embrace crypto-currencies.

Participation in Project-X

Trust Producers

Stakeholders

Chain Nodes

Bounty Hunters

Network Participant

Larger Ecosystem

Other Blockchains

Token Creators

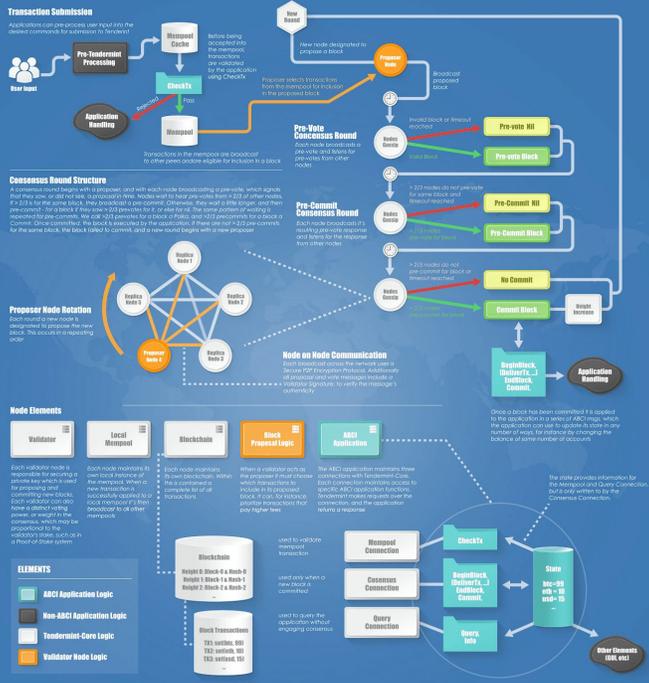
DAPP Developers

APP Developers

Mainstream Institutions

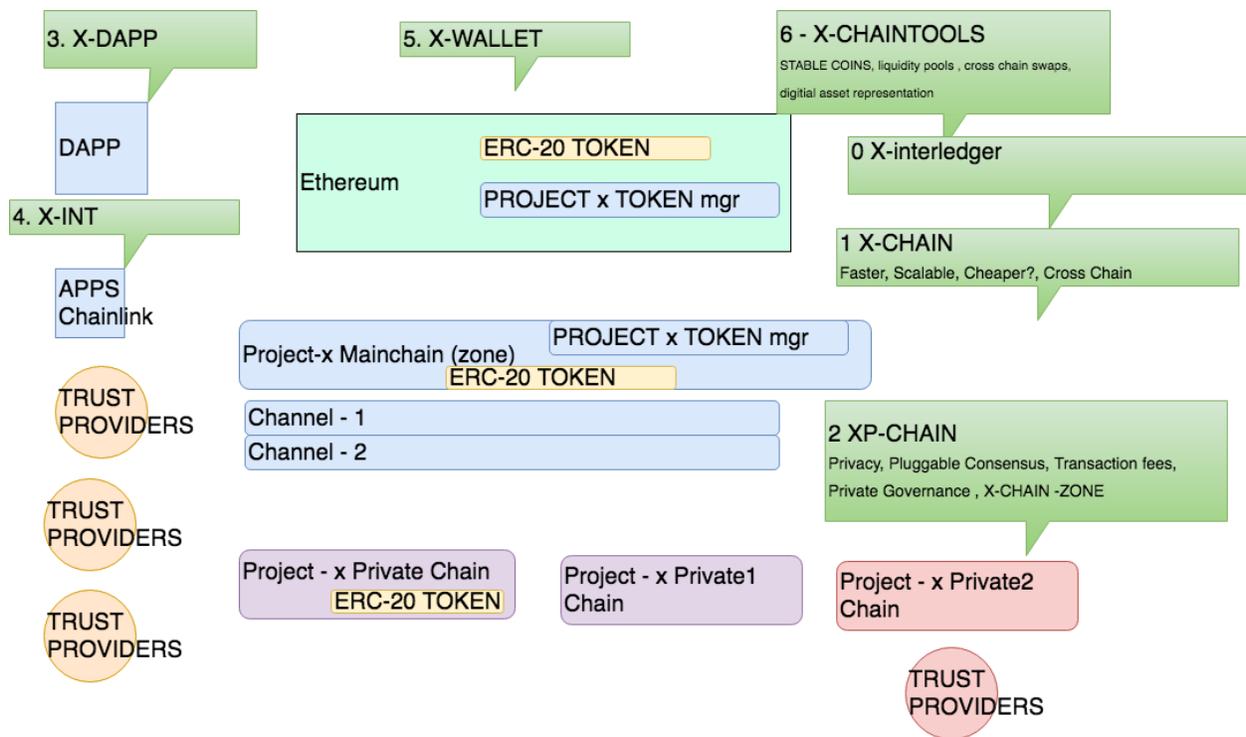
Wallet Holders

Tendermint in a Nutshell



Design Overview

Project-X is a foundational offering which can be leveraged to enable value transfer and liquidity across chains. It does this by leveraging, enhancing or building standards based offerings across the breadth of the chain and also cross-chain and off-chain. This framework can be leveraged across the whole solution ecosystem including Organizations building block-chain offerings, Decentralized application builders and traditional application builders below gives an overview of the features that Project-X offers.



XBC - Blockchain (Peregrine) : Designed for speed and scalability in order to ensure that it can support use cases such as Payment Platforms offering real time settlement, Trading Platforms and other high volume high speed scenarios. It leverages a DPOS consensus model with Governance of Trust Providers (Block Producers/Validators) to ensure consistent transaction volume and settlement time. This is done by setting standards for trust providers such as processing speed and RAM as well as incentivizing them for uptime and penalizing downtime.

XBI - Interledger (Penguin) : Designed to enable value transfer across chains. It consists of an orchestration platform (built on the Project-X Blockchain Platform) as well as standards for interoperability which can be leveraged by other blockchain platforms to execute transactions

across chains. Finally it leverages XDO Offchain Orchestration for integrating with Centralized Applications.

XDC - Developer Center (Philetairus) : The decentralized application (DApp) center is a suite of tools that provide application developers with the capabilities needed to build both vertically siloed applications on the Project-X Platform as well as Cross-chain, cross-currency applications.

XOO - Offchain Orchestration (Pelican) : Initially starting with robust API's and integration capabilities and moving to templated offerings by vertical as well as Platform As A Service (PAAS) offerings. The application center will enable centralized application developers to easily integrate and harness blockchain capabilities to empower rich cross platform capabilities.

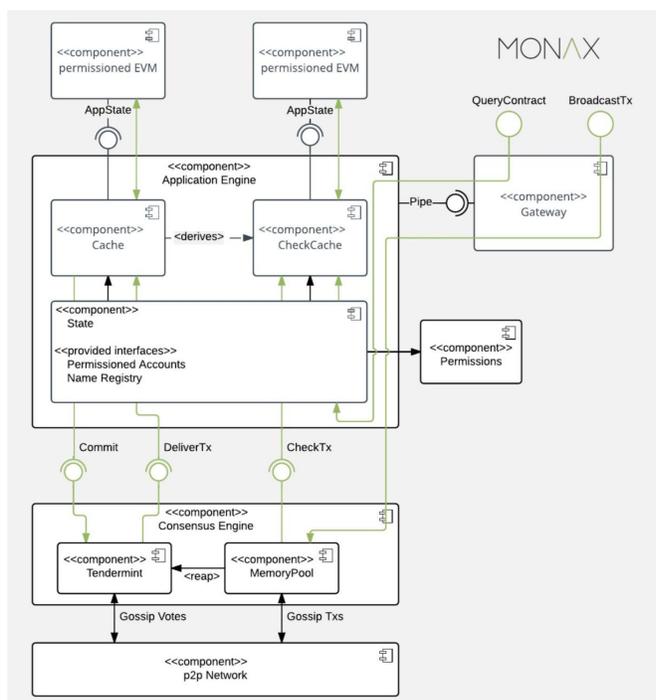
XMW - Project-X Multi-wallet (Chipmunk) : The multi-wallet offers ease of use enhancements such as simplified key-management and the ability to store multiple currencies and assets (from disparate chains). Project-x focus will be on building out the underlying infrastructure including light-client capabilities as well as real-time settlement. We shall partner with both wallet developers to build on top of Project-X as well as payment platforms to enable a new age of digital currency payment solutions.

XCT - Chain Tools (Rosetta) : Chain Tools are a suite of system smart contracts and contract templates. The System smart contracts offer functions around governance, incentivization, inter-blockchain communication and smart contract integration capabilities with external systems. The contract templates are a library of contracts offering capabilities around stable-coins, liquidity, digital asset management and currency controls, token factories and registries which can be used for white labelling wallets for different applications.

XBT - Business Tools (Weaver) : Business Tools enable the effective administration, deployment and integration of Business Applications. It leverages the following Key Components. XOO Offchain Orchestration provides both Connectors and Workflow process Capabilities. XCT Chain Tools allow the definition of Roles and Behaviour which are executed upon XBI Interledger as well as the ability to Define Digital Assets on chain. XDC Developer Center offers templating and the ability to define Assets and flows leveraging Smart Contracts without having to write chaincode. Finally tools such as Analytics, System Monitoring and Deployment offerings are offered as part of Project-X PAAS offering the XBT Portal.

Modules and Components in Depth

APPLICATIONS				
PLATFORMS	ICO PORTAL	INVESTOR PORTAL	SUPPLIER PORTAL	PRODUCT PLATFORM
PLATFORM CONTRACTS AND STANDARDS	ICO MANAGER	INVESTMENT MANAGER	KYC MANAGER	PRODUCT CONTRACTS
ALTERNATE CHAINS	ASSEMBLY CHAIN	ETHEREUM	OTHER BLOCKCHAINS	
TOOLING				
ASSEMBLY PLATFORM SMART CONTRACTS	ICO LAUNCHER	TOKEN MANAGER	SUPPLIER MANAGER	PLATFORM MANAGEMENT
SMART CONTRACTS DEVELOPMENT TOOLS	CHAINCODE SDK	FORMAL VERIFICATION	MULTI-SIG WALLETS	EVENT MANAGER
PERMISSIONING AND CREDENTIALS	WALLETS	MEMBERSHIP SERVICES	HSM	
INTEGRATION AND DEPLOYMENT TOOLS	DEPLOYMENT SUITE	INTEGRATION LIBRARIES	ORACLE SERVICES	ORACLES (KYC)
CLIENT INTERFACES	JSON-RPC - gRPC	ASSEMBLY API	ASSEMBLY INTRA-CHAIN	INTER-CHAIN
PRIVACY / SCALING				
PRIVACY	ON-CHAIN	PRIVATE CHAINS	PRIVATE TRANSACTIONS	
SCALING	CHAIN TREES	CHANNELS	OFF-CHAIN COMPUTE	PLATFORM MANAGEMENT
ASSEMBLY DLTE				
STORAGE / LEDGER	ON-CHAIN PUBLIC STATE	PRIVATE-CHAIN STATE	ON-CHAIN STORAGE	OFF-CHAIN STORAGE
EXECUTION	AVM	SYNC	PRE-COMPILED CONTRACTS	TRUSTED EXECUTION
CONSENSUS				
PLUGGABLE CONSENSUS	PUBLIC CONSENSUS	PRIVATE CONSENSUS		
HOSTING				
HOSTING OPTIONS	BLOCK PRODUCERS	ASSEMBLY CHAIN	PRIVATE ASSEMBLY CHAIN	
LEGEND				
	ASSEMBLY COMPONENT	ASSEMBLY PLATFORM	PRODUCT PLATFORM	EXTERNAL PLATFORM



XBC - Blockchain (Peregrine)

Communication Layer : Project-X will leverage traditional communication protocols such as JSON-RPC and gRPC using protocol buffers.

Transaction Set : Project-X Blockchain will provide support for a Transaction processing and routing system to facilitate transactions across chains. Initial thought is that this will either leverage or compete with Cosmos [23] Application Blockchain Interface[24] and moving forward may also follow practices similar to Polkadot's [25] offering.

Project-X Virtual Machine (XVM) : Project-X will offer a Virtual machine for the execution of chaincode. The vision for this is to support multiple programming languages and as such will look to leverage the WebAssembly (WASM) stack machine[27].

System Contracts : System contracts will be provided to facilitate governance including Incentivization Modelling and StakeHolder Modelling. Moving forward additional templated governance for existing verticals may be written, examples may be found in the Use Cases section.

Scalability : Project-X Scalability is primarily based on a Delegated Proof of Stake consensus algorithm for example tendermint [14] and its governance of trust providers which ensures high memory and cpu instances with minimal down time. Further scalability and privacy enhancements may also leverage Sharding[10], Plasma[13], Channels[17] and Trusted Off Chain Execution[16][30].

Also Project-X Blockchain has the ability to support a complex topology of private chains, side chains, chain trees, hubs and zones, depending on the organizations use case. For these deployments it is envisaged that the trust providers may provide trust for multiple chain instances.

Light Clients : Light Clients[28][29][3] offer the ability for devices with limited processing capabilities to have an accurate view of the chain without needing to store the whole chain and process every transaction, making it perfect for mobile apps and the internet of things. Because of Project-X cons

Multi Wallet : Support for Multi-currency Wallets [31] is provided through XMW. Peer Transfer and currency swap functionality is built out using Order Books functionality similar to that of MARKETPROTOCOL [36] or Stellar [20] or that leveraged by Atomic Wallet[32][33]. And Multi-Wallet integrates with XBI Interledger which provides real multi currency support using Peg Zones[34] and Hard Spoon [35] functionality.

Consensus : Numerous Consensus Protocols are available. XBC offers pluggable consensus depending on the environments needs. This comes in three modes Instant Seal or Standalone usually used in Development Environments but may be deployed on Private Chains depending on the owners needs. A Delegated Proof of stake [37], this will initially leverage Tendermint [38] will be run on Mainnet. Moving forward we may also move to a Proof of Authority [39] or leverage a protocol similar to that of EOS [15] or Stellar [20].

Staking : XBC uses a Delegated Proof of Stake Consensus model and as such Trust Providers will be incentivized to keep XBC running. This involves Token Owners staking Trust Providers and the amount of Stake a Trust Provider has determines the number of blocks produced. It is initially envisaged that there will be upward of 20 active Trust Providers with approximately 100 total Trust Providers being incentivized to be ready to produce blocks. Models will be similar to those leveraged by Cosmos [40] and EOS [41] with monitoring and incentivization tools similar to that of RocketPool [42].

Trust Providers (Hosting) : XBC will be supported by a community of Trust Providers whose role it is to produce blocks and secure the Network. It is envisaged that there will be a community of approximately 100 active trust providers initially which may grow to 300 over time. Of those 100 active trust providers approximately 20 of these will be eligible to produce blocks at any given time (based on staking above) with the remaining trust providers being incentivized to ensure they are up and can be hot swapped at any point in time should an active block producer have operational issues. This model is similar to that of Cosmos [43] and EOS [44]. As the network grows and specifically if Developers require their own private chain. The same Trust providers should be able to be leveraged for the private chains with similar but separate incentivization models. This allows the Private Chain to define its own economics to suit its use case around performance up time and number of validators. For example if a private chain felt that it needed fewer trust providers as they were happy with a more centralized chain or felt that they needed higher or lower performance and hence RAM and Processing power they could modify their governance Policy accordingly. Finally a later phase will genericize the role of trust providers so that the trust provider may be leveraged by multiple chains and may introduce a governance layer above the trust providers, similar to that proposed by Polkadot [25].

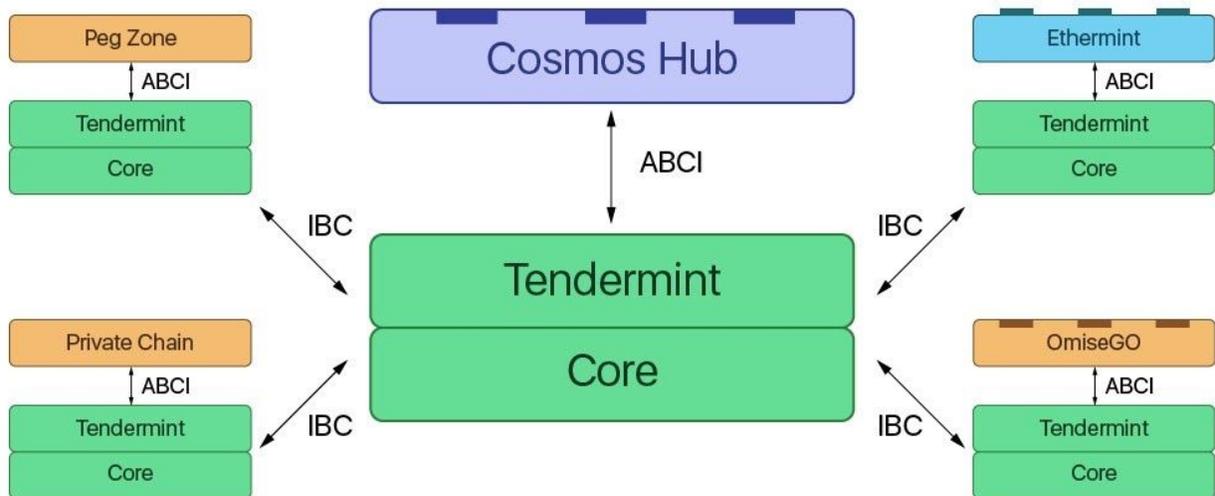
XBI - InterLedger

Overview XBI allows for an ecosystem of Blockchains with the ability to connect through various hubs. The below diagram gives an overview of the use of chains. Let's start with options for an application developer who wants to define their own currency and build an application on top of a chain their options for deployment are as follows

Existing Chain - Developers can continue to leverage platforms such as Ethereum and EOS to deploy existing tokens and build their applications on these platforms. If they want to allow for inter-chain fungibility they can leverage a hard spoon to represent their currency on XBI-Peg Zone, an XBI-HUB will facilitate the interoperability using Inter Block Chain Protocol (IBC) and Application Block Chain Interface (ABCI). In this scenario XBI facilitates fungibility only, with the tokens and application running on other chains which means that the functionality will be subject to the economics (gas fees, bandwidth costs) of the existing chains as well as transaction times and congestion of those networks, if any.

XBC - Mainnet - Developers can deploy their tokens on XBC Mainnet. Similar to above fungibility and interoperability will be provided by XBI. Additional benefits of deploying on XBC - Mainnet include speed and scalability improvements (compared to say Ethereum or Bitcoin), enhanced development, integration, chain code templates and deployment offerings provided by XDC, XOO, XCT and XBT respectively.

XBC - PrivateChain - Finally developers wishing to run private permissioned chains, where they can control their participants or want to have the ability to define their own economics and governance around trust provider incentivization and transaction fees, can set up a private chain. Here they may leverage the ecosystem of XBC trust-providers and have complete ownership of all transactions and transaction volumes running on their chain. Use cases for this offering include Market Operators who wish to provide a platform for their Market Participants. This can still leverage XBI for cross-chain fungibility and data sharing as required.



X-ABCI - Project-X will offer an ABCI [47][48] layer conforming to standards leveraged by EOS [37] and Tendermint [38] . Moving forward as we look at moving to EVM 2.0 or a WASM based Virtual Machine it is envisaged that we will produce an open source WASM compliant version. Which may be enhanced to offer additional transactions as needed using a similar development model as OneLedger [49] but with WASM support.

Blockchains are systems for multi-master state machine replication. ABCI is an interface that defines the boundary between the replication engine (the blockchain), and the state machine (the application). Using a socket protocol, a consensus engine running in one process can manage an application state running in another.[47]

X-IBC - Project-X will facilitate Inter BlockChain Communication (IBC) similar to that of Cosmos [50] and EOS [51]. As specific vertical use cases are explored this may be extended.

The IBC protocol defines a set of semantics for authenticated, strictly-ordered message passing between two blockchains with independent consensus algorithms.

XPZ - Peg Zone Peg Zone functionality will be created in XPZ originally based on the initial design from the cosmos team.

“A peg zone is an account-based blockchain which bridges zones within Cosmos to external chains like Bitcoin or Ethereum. It acts as an adaptor zone — or a “finality gadget”, in Casper-speak — which translates finality for probabilistically finalized blockchains by imposing a “finality threshold” at some arbitrary number of blocks to achieve pseudo-finality. Generally, this “translator” zone design can be classified as a 2-way peg (2WP).” [45]

Moving forward XPZ may be enhanced to offer more flexibility around updating smart contracts using X-UPG also additional XCT (Chain tool) functionality around orchestration of pegging as well as a more generic replication scheme catering for non-currency data replication use cases. Currency bridging will be facilitated using Hard Spoon Functionality [35].

“Hard spoon: a new chain that takes into account state from an existing chain; not to compete, but to provide broad access.” — Jae Kwon

Finally these capabilities can be leveraged by Decentralized exchanges or Multi currency wallets to provide Solutions similar to Omisego [46] and AtomicWallet [32]. This solution is more scalable and benefits from standardization as it replaces individual connectors and centralized application logic with a standards based protocol and one entry point , the peg zone, which facilitates transactions for all currencies pegged to that zone.

XLBCC - Light BlockChain Clients - For each chain in the ecosystem we will need a dedicated endpoint for the IBC to work with. For this we will either deploy our own nodes or light clients for the associated chains (the largest three being Bitcoin, Ethereum and EOS) or work with trusted partners who can guarantee stable endpoints for the associated chains.

Complex Cross Chain Scenarios - If we wanted to orchestrate more complex cross chain scenarios which may not be catered for by pegging functionality, we could potentially leverage the orchestration capabilities provided by a combination of XCT (Chain Tools), XOO (Orchestration) and XBT (Business Tools).

XDC - Developer Center (Philetairus)

Software Development Kits - Project-X will offer WASM[52] as it's virtual machine to run chaincode, this will be based initially on eWASM [53] and supports multiple languages including go[54] and rust. Tools around Formal Verification[56] will help in ensuring smart contract functionality is correct. Also extensive documentation and Cloud Based IDE's will be offered.

Rest API's - Robust, CrossChain Interledger, XOO Offchain Orchestrations

Smart Contract Capabilities - Event Triggering, Event orchestration, Registries, Templating and Ease of Deployment.

Business Modelling - auto generation of smart contracts and standards based templates leverages XCT

Identity Management Capabilities - OKTA, OSS Integration, Lumeos, Dock, ENS?

Privacy Capabilities - ACL'S, Endorsement Policies, Private Transactions, Channels?

XBP - Business Process Modelling - Workflow Tools allowing cross chain and cross application modelling of flows leverages XOO

XOO - Offchain Orchestration (Pelican)

Connectivity - Supported Protocols, grpc, json-rpc, ssl, websockets, etc

Messaging Standards - Vertical transaction sets similar to how [Block Collider](#) supports [fix](#)

Orchestrations - Workflow runtime (either via smart contracts or bpm middleware)

XMW - Project-X Multi-wallet (Chipmunk)

Order Book Functionality

Key Management

ENS - Name Services

Multi Currency Balances

Platform support - Mobile - Web Hardware Wallets

XCT - Chain Tools (Rosetta)

Governance Templates - Staking , Voting, Monitoring, etc (see rocket Pool)

Event Orchestration - Being Triggered from and being able to call other applications as part of a Logical Unit of Work

Financial Tools - Stable Coins, Liquidity Provisioning

Privacy Tools - Endorsement Policies, Private Transactions, Access Control Lists, Trusted Off-chain execution, [Naming Services](#)

Token Standards

Digital Rights

XBT - Business Tools (Weaver)

Administrative Portal

Analytics

Platform as a Service

Business Modelling

Identity Management

Templating Tools

Feature Breakdown

Below is an overview of the key features that the Project-X Platform provides to solve the problems with today's crypto-finance solutions

- Interoperability
 - InterLedger Operability
 - IntraLedger Operability
 - OffChain Interoperability
- Scalability
 - Pluggable Consensus
 - Block Producers/Validators - Governance
 - Chain Scaling Solutions
 - Sharding, SideChains, Plasma, PolkaDot
 - Distribution of Work Enhancements
- Transaction Costs
 - Incentivization Governance - includes capabilities for DAPPs buying and paying for bandwidth
 - Simplified Cost of Trust Consensus Algorithms
- Hard Forks
 - Inter-chain protocol and Chain Scaling Solutions
 - Soft Upgrade Capabilities (WASM meta-protocol contract)
- Privacy / Security / Key Management - Ease of Use
 - Cross-Chain Multi Sig Capabilities
 - Decentralized secret store & signer
 - Centralized Key Management (Provided by Innovation Partners)
 - Human Readable Addresses
 - Off-chain - [OAuth](#) Integration and [OKTA](#) Integration
- Self Governance
 - Consensus Algorithms including Proof of Stake
 - Governance Mechanisms including smart Contracts
 - Governance - Delegation Capabilities
- Digital Rights Management
 - Delegation capabilities (including allowances)
 - Cross-Chain Multisig

- Off-chain digital asset rights management
- Financial Tools
 - Smart Contract Capabilities
 - Bridging Capabilities
 - Economics and Incentivization Capabilities
- Development Difficulty and Complexity
 - SDK's
 - Smart Contract - Multi Language Support
 - Cloud Based - Development Environments
 - Simplified Deployment Options
- Mainstream Ecosystem Integration
 - Robust API's
 - Event Orchestration
 - Cross Platform Value Transfer Coordination
- Ease of Use
 - Wallets - see Privacy / Security / Key Management - Ease of Use
 - Development - see Development Difficulty and Complexity

Use Cases

The Project-X offering will bring a new foundational offering which will power the development of Finance 3.0 applications, some of the applications anticipated to be built on Project-X include

- Decentralized Exchange - Crypto Assets
- Centralized Exchanges - Crypto Assets (DEX + KYC + AML + Key Management)
- Multi-currency Wallets - A wallet that can hold multiple crypto-currencies from different chains
- Financial Tools - Cross Chain and Platform Financial Tool Capabilities including
 - Stable Coins - leveraging Multiple cross chain currencies (e.g. MakerDao)
 - CDP Positions
 - Governance Models -
 - Delegation (usufruct) models - Crypto - Lines of Credit - Allowances - Delegations
- Digital Asset Exchanges - New generation of exchanges integrating crypto-finance with existing commodity markets and trading platforms
- White Labeled Finance 3.0 PAAS Offerings -
- Finance 3.0 Development Suites
- Prediction Markets
- ICO Platforms
- Betting Platforms

Project X intends to enable a new wave of innovation for business applications. Extensive use cases come from Project X's cross-chain and PAAS capabilities. Some of the primary use cases are targeted towards business and consumer applications, across both decentralised and centralised applications.

Project X's PAAS platform empowers application developers and businesses to commission applications with new business models, approaches to data privacy, ownership and portability. Businesses will have the ability to launch a robust and configurable blockchain platform to suit their application.

Use cases:

- Cross chain asset portability, verification and value transfer
- Cross chain oracles
- Cross chain contracts
- Cross chain, cross organisation and data source messaging
- Handle business and mission critical data on side chains for performance and privacy
- Handle low value and high volume micro transactions on payment channels
- PAAS tools with workflow capability to launch business applications with ease

- (future roadmap- science fiction at this stage) AI for cross chain interoperability in the future i.e. AI for Smart contracts and cross chain blockchain consensus

Potential application in key industry verticals:

Financial services, in areas such as payments, settlement, compliance, verification, fractional ownership, transfer of digital asset and Finance 3.0 Development Suites

DEX, traders will no longer be limited to ETH and BTC pegging. Inter-chain transfers will enable transfer to and from any chain (reducing market power of centralised exchanges and organisations)

Commerce, such as cross-chain trading exchange, centralised trading exchanges, lending platform, cross chain wallets

Ecommerce & Marketplaces, such as a ride sharing application and digital asset marketplaces

Fair play, Gambling & Prediction Markets

Gaming

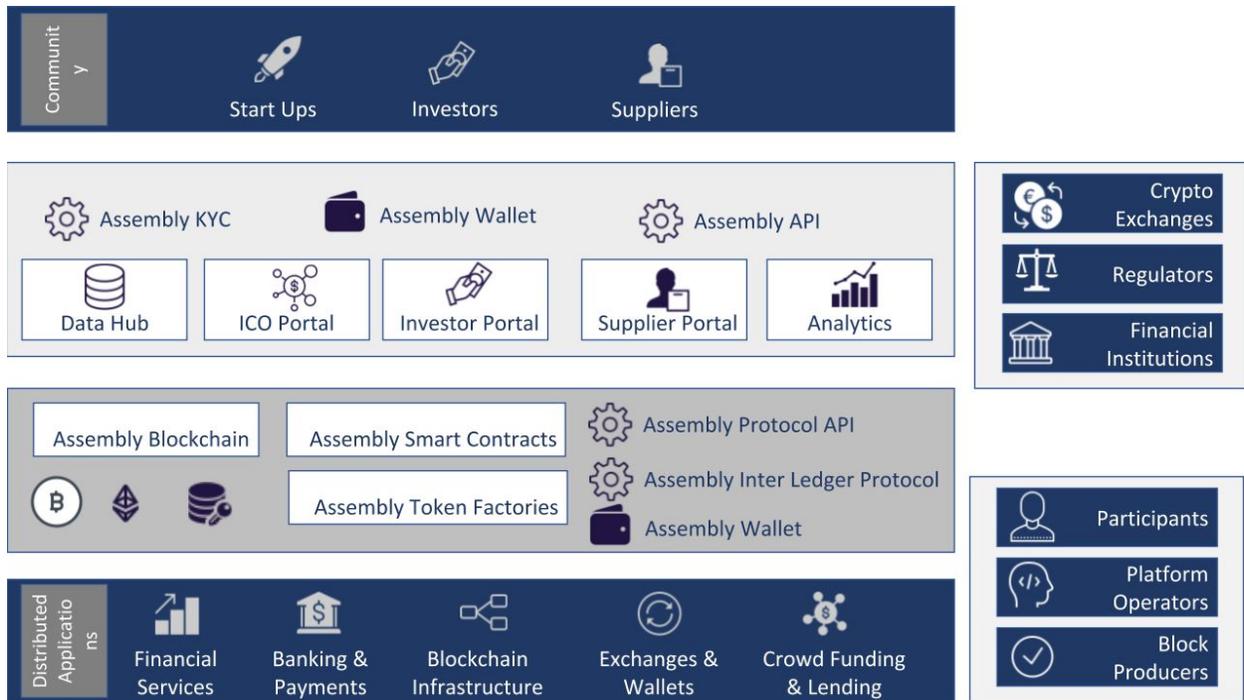
Media, control of ownership rights

Identity Management & Digital Rights

Digital Voting,

Social Media & content sharing, privacy focussed peer to peer messaging platform with opt-in or out of different privacy features, cross chain peer to peer messaging platforms

Activity Logging, web traffic logging, metrics



Conclusion

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random number generators (without deterministic seeding)

race conditions on threads (or avoiding threads altogether)

the system clock

uninitialized memory (in unsafe programming languages like C or C++)

floating point arithmetic

language features that are random (e.g. map iteration in Go)

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From cosmos riot chat

Hello everybody~ I have a question.... Can cosmos transfer information besides token between blockchains??

Tuesday

RZSD

adrianbrinkCosmos Network (+cosmos:matrix.org)

01:36

Yes, IBC is technically only a proof-carrying data transfer. Tokens are just a specific kind of data that is being transferred.

Appendices

Appendix A - Areas for Disruption

Appendix B - Digital Rights Management

Appendix C - Competitive Landscape

Areas of Focus - Customers (who/vertical,why,where), Technology, Differentiating Factors

Notes : [Atomic Swaps](#)

Features are broken down by core offerings

Blockchain - (Speed, Scalability, Cost of Trust, Privacy)

Interoperability - Fungibility,

Token Tools - Currencies, Assets, Liquidity (CDPs), Stable Coins, Escrow, Funding

DAPP Development - SDK's, Integrations, Cloud based IDE's, API's

APP Development - Integration, Orchestration, Asset Modeling

Multi-Wallet - Mutli Currencies, immediate settlement, Light Client

Rated Low Medium or High

Network participants - block producers, app developers,

Core Participants: Trust Providers, Stakeholders, Chain Nodes, Bounty Hunters

Extended Participants: Other Blockchains, Token Creators, DAPP Developers, APP

Developers, Mainstream Institutions, Wallet Holders

Projects	Participants	Key Features	Project X Differentiator
COMIT		<p>Sector:</p> <p>Features:</p> <p>Payment platform</p>	
Cosmos		<p>Sector: Blockchain Foundational platform</p> <p>Features:</p> <p>Interoperability</p> <p>Ability to launch/build a blockchain</p> <p>Tendermint</p> <p>Not designed for shared infra</p>	
Fusion		<p>Sector:</p> <p>Features:</p>	
Polkadot	Blockchains, Trust providers	<p>Sector: Blockchain Foundational platform</p> <p>Features:</p>	<ul style="list-style-type: none"> - not a blockchain - DAPP platform - token tools

		Interoperability Ability to launch/build a blockchain Simple tendermint WASM Proof of authority Advanced security with shared infrastructure	- WASM
Wanchain		Sector: Features:	
ICON		Sector: Features:	
AION		Sector: Features:	
Digital Asset		Privacy Security	

Appendix D - Problem Summary

A key driver for value is usability or liquidity. That is being able to exchange value quickly and efficiently across a large audience and have the value be fungible against other assets. Blockchain thus far has done a wonderful job of decentralization specifically around the use case of currency and fundraising. As we move forward and the ecosystem grows gaining more users, more digital assets, more use cases and more chain offerings below are some of the key challenges that must be addressed.

Scalability : Blockchain offerings have traditionally had limited bandwidth and long transaction times this is due to a number of reasons but decentralization and distributed trust are key factors.

Interoperability : Blockchain offerings have traditionally been siloed. Each appealing to a specific vertical. As the ecosystem grows the blockchain ecosystem is becoming fragmented.

Cost of Trust : Blockchain offerings have traditionally had a high cost of trust which has risen as the economic value of the Tokens on the chain have increased. This is primarily due to two main factors both relating to the Consensus algorithm. For example a Proof of Work Consensus algorithm is expensive computationally also it relies on a large set of nodes to validate the chain.

Asset Fragmentation : Blockchain governance is still evolving, early offerings were seen as monolithic platforms without the ability for all stakeholders to agree on the future direction of the platform and move in that direction. This has led to “hard-forks” for both Ethereum (Ethereum-classic) and Bitcoin (Bitcoin cash). When this happens parallel chains are spun up thus Fragmenting the Asset offerings on these platforms. Also the lack of extensibility of these platforms has given to the rise of many vertically focused chains with different Assets. reducing fungibility and liquidity of the Assets on these siloed chains.

Self Governance : As mentioned above Blockchain governance is still evolving, with traditional offerings placing limited tools around the incentivization of Trust Providers. As the blockchain ecosystem evolves and we moved towards decentralization not only within one chain but across chains a number of new governance tools need to evolve. These are currently being worked on and include the following Trust Providers incentivization, Token Governance, Risk Management Governance and many more.

Financial Tools : Financial Tools for blockchain are rapidly evolving. The first widely adopted use case was that of digital currency by bitcoin. This was followed by Ethereum with its Smart Contract Layer which brought the ability for organization to define their own currency via the ERC-20 standards which in turn led to the raising of capital using these currencies making ethereum a leading player in Initial Coin Offerings (ICO's). We are now seeing the ability for

Blockchain to be leveraged for a multitude of use cases and the Financial Tools need to evolve to support these. Key examples of this are stable-coins addressing price instability and offering a toolset to set risk profiles to drive the adoption and security of the coins. Other tools which are following include Digital Assets (supporting the shift of existing trading platforms onto blockchain) as well as Trading Algorithms, Staking and Funding Tools just to name a few.

Digital Rights Management : Blockchain has done a wonderful job of securing digital rights of assets via cryptography. The first use case once again being for currency on a siloed chain. As the ecosystem evolves a new era of digital rights management needs to accompany the evolution. This needs to address cross-chain identification verification and sharing rights to digital assets across chain to facilitate higher fungibility. Other key areas where digital rights will evolve around include allowance capabilities, liquidity management and collateral debt positions.

Blockchain Development Complexity : Blockchain offers right capabilities but developing decentralized apps on these platforms have brought with it considerable complexity. Following are some of the key challenges which are being improved upon. Development Infrastructure costs, Limited and evolving Smart Contract programming Languages, Integration capabilities both with other chains and off-chain systems and broader tool sets such as Analytics, compliance and audit capabilities.

Mainstream Ecosystem Integration : Until now blockchains have been very effective securing transactions on chain. As blockchain becomes ubiquitous and integration with mainstream systems become commonplace more robust integration capabilities will be required. We have already seen the extensive use of Oracles as data sources that may be leveraged by smart contracts. As we move forward other key building blocks include workflow capabilities around business process execution across platforms, trusted off chain execution, transaction atomicity across both chain and traditional systems.

End User Adoption : Whilst blockchain adoption has been increasing at a phenomenal pace there are still additional barriers preventing mainstream adoption. Indeed the majority of users are currently tech-savvy millennials many of which work in the crypto space or users of Centralized exchanges who provide a level of comfort and security for casual users at the cost though of centralization. For end users trying to work natively with some of the challenges include disparate practices for each chain, lack of multi-currency wallets, non-readable addresses, lack of key recovery capabilities. Finally loss of funds due to losing keys or sending funds to invalid addresses make many users reluctant to embrace crypto-currencies.

Miscellaneous

Value proposition

Mission

- Interconnect decentralised ecosystems and organisations
- Focus on interoperability, speed and privacy

Unlock the silos of information and value through a unified ledger. We intend to break down the barriers of organisational silos and regionalised economies. A fully interconnected web of internet of value, where value and information can be transacted with no barriers.

- Interconnecting organisations for frictionless interactions and exchange of value regardless of blockchain governance models with a focus on interoperability, speed and privacy
- Create your own blockchain and be in control of your chain destiny while remaining connected to broader internet of value
- Exchange value and information (beyond your network) at high speed, frictionlessly, securely and privately across decentralised ecosystems and organisations (, data sources and blockchains without any geographical limitations)
 - ~~*I.e. imagine frictionless transactions and ease of transactions with your suppliers and customers, execute smart contracts based on external events or other blockchains, represent ownership of assets in a digital manner on the blockchain, Connect offline world and external events with native blockchain*~~
- Unlock economic inefficiency through application of decentralised trust to realise frictionless transactions, ease of exchange of value and information, increase trust between parties, low cost and instant settlement,
- Standardise interorganizational process, reduce cost of operation, improve price discovery, market liquidity.
- With Project-x we intend to bring change in the current economic and political paradigm by interconnecting decentralised ecosystems and centralised organisations through blockchain technology. We envisage this sort of interconnectivity will drive global economic growth through reduction in deadweight loss and economic inefficiency.