



Blockchain middleware for the front-end developer



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Abstract

Espresso will be the premier platform for developers, enterprises and organizations seeking to develop data-rich web, mobile and decentralized applications that interoperate with the leading blockchains and smart contract platforms.

Among the most interesting and disruptive features of blockchain and smart contract platforms is the ability to securely manage access to distributed data based on majority consensus. It has been shown that selectively moving application data, logic and infrastructure services to private and public blockchains can result in lower operational costs, better data security, greater accountability, and higher transaction throughput. Tests in a number of industries including financial services, retail, and personal identity management point to an appetite by businesses to adopt blockchain technology.

The problem? It's not easy to develop on blockchain. The technology is inaccessible to many developers that do not possess experience in C++, Rust, Go or other system-level development languages. In addition to having generally complex programming environments, platform and infrastructure administration of blockchain networks on which DApps are deployed, can require a significant level of expense, effort and experience. Many product and front-end engineers do not possess experience in any of the aforementioned areas and as such cannot find an entry point to start developing blockchain-based decentralized applications.

Other considerations when designing enterprise-level distributed/decentralized applications:

- Data may not exist on a single chain,
- Data may need to be mixed with legacy and off-chain data
- Data access patterns must be flexible and able to be aggregated into idiomatic APIs
- Data delivery and access must be “high availability” on the order of a standard web/database app

None of these concerns are easily addressed with base layer and first generation blockchain technology. Espresso will change this with a platform that enables complex and scalable application development which aggregates blockchain-based smart contract data, oracle-provided external data, and legacy off-chain data. This will all be exposed in a unified API which provides everything you need to write applications for the next generation of the web.

Introducing Espresso

Espresso provides a platform and tooling which doesn't require knowledge of, but can be integrated with common enterprise and popular frameworks such as Node.js, .NET, Ruby on Rails, Python and more. Through our blockchain-agnostic, serverless approach, we're making it possible for developers of any level to build creative, data-rich applications on blockchain quickly and efficiently.

Developers building with Espresso will have convenient access to technology tools that will define software development over the next decade and beyond:

- Espresso's abstract/aggregate data tier is a consensus-based peer-to-peer network protocol that includes a distributed ledger, a fabric of domain specific sidechains, and a crypto-token with extremely high transaction speeds.
- Espresso provides REST and GraphQL interfaces, the most widely accepted network programming paradigms which are used by the world's most data-rich consumer websites and applications: Facebook, Pinterest, Twitter, Yelp, Intuit, and many more.
- Espresso leverages some of the most scalable and current technologies today, including Erlang, Elixir, Javascript/Node, Ruby, Python, Rust, Elm, React and more.

The Current State of App Development on Blockchain

A “blockchain” is a decentralized, public, and consensus-based shared ledger of transaction history on which integrity of data is guaranteed by using proven asymmetric cryptography practices and various consensus methods, the most popular of which is Proof of Work (PoW) mining as seen in Ethereum and Bitcoin. This method of finding consensus has proven to be highly secure but has some fundamental drawbacks which result in the excessive consumption of electricity on the order of >70Twh annually, which is roughly equivalent to the amount electricity used by the country of Chile in the same period of time.¹

Some more recently conceived blockchain networks achieve consensus using more complex, less wasteful methods such as Proof of Stake (PoS) and Proof of Authority (PoA). These methods, while not as well vetted as PoW, have proven themselves viable in public production settings for several years and are being researched and developed by some of the most prolific developers and researchers in the space. It allows for extremely high transaction speeds and avoids the power consumption issues inherent to PoW.

The goal of these methods is to achieve absolute data integrity in a “trustless” or decentralized environment even with the presumed existence of a minority group of “bad actors”. There are many use cases in which a level of shared transparency is desirable and with the advent of blockchain this has become available to developers and businesses as a new way to design highly resilient applications.

To date, blockchain has been most closely associated with cryptocurrencies like Bitcoin, but its inherent benefits – security, transparency, efficiency, and distribution – make it an attractive option for all application development.

Security

Although not immune from attacks, for certain use cases blockchain networks provide a more secure alternative to the majority of existing database technologies. New blocks of data are verified by consensus, or a network-wide agreed upon set of rules that define what is considered to be valid data. In some cases the forger of a given block must be granted the authority to add new data to the chain. By using a cascading system of hash or “Merkle” proofs, data that has already been written to the blockchain is immutable, meaning it can’t be changed without the consent of the majority of network participants. This reduces the likelihood of rogue actors successfully forging or misrepresenting existing data. It also mitigates the addition of invalid or erroneous data to the top of the chain.

Transparency

Most popular blockchains provide immutable protection against fraudulent transactions and data tampering. The majority of the smart contract execution blockchain platforms e.g. VeChain, Ethereum etc. are public in nature, meaning that all users maintain identical copies of records on the ledger and all data is visible to all users. Data on the blockchain cannot be destroyed, which means users have a fully traceable record of timestamped and digitally signed transactions.

Efficiency

Smart contracts are digital instructions or “programs” that execute within the blockchain and add user-defined logic and behaviors triggered by and resulting in transactions, data storage and data access. Many contracts rely on timestamps or oracles that trigger events when predetermined conditions are met. Because they are stored on a cryptographically secured public ledger, these instructions are immutable and transparent to all participants in the network. The combination of these features can achieve a level of provability, immutability, traceability and compliance, which can be verified objectively.

Distribution

One of the most appealing aspects of blockchain and decentralized smart contract execution platforms is the approach to application deployment and distribution. The core of any DApp is one or more smart contracts which are deployed a single time to the network by the developer. Upon deployment an application is propagated to every node on the network and available to any authorized user or service via all public or privately hosted nodes. There is no approval process other than sound executable code and the associated network fee for deployment.

The blockchain appeal to developers

Blockchain, smart contracts and decentralized computing are already having an enormous impact on application design, development and delivery. Decentralized blockchain technology is disrupting network application practices because it fundamentally changes the way we access and share technology. It is our position that this shift will only become more observable in the very near future.

Unsurprisingly, in our research and discussions with all levels and types of developers, we have found that they want to build on blockchain for a variety of reasons. While we will be releasing a research report dedicated to this topic exclusively, the prevailing motivations of developers seeking to engage the blockchain space are the ability to command higher salaries, a perceived proclivity for companies in the space to address more interesting and progressive problems, and most notably they see blockchain and decentralized computing as having enormous potential to reshape the world in the same way the internet has.

By introducing a layer of transparency and trust to a number of different problem domains such as tracking supply chain events and interactions, home buying, voting and legal services, developers who create blockchain-based applications have the opportunity to make life easier and more equitable for millions of people.

An emerging business priority

Businesses of all sizes are recognizing the opportunities and potential advantages presented by this emerging technology. Startups are looking to provide innovative solutions on blockchain while enterprises want to replace legacy data systems with blockchain applications. Financial services companies are some of blockchain's earliest adopters, in part because the technology promises enormous cost benefits. Research estimates that banks could save up to 30 percent in infrastructure costs, or between \$8 billion and \$12 billion each year, by investing in blockchain. Specifically, these businesses could cut spending on financial reporting by 70 percent, compliance responsibilities by 50 percent, and business and central operations by 50 percent.²

It's not just financial services that stand to benefit. IBM and Samsung have developed a blockchain-based proof of concept to support Internet of Things (IoT) applications. DocuSign and Visa developed a connected car proof of concept to simplify car leasing and payments.³ Hospitality and retail businesses are exploring blockchain to support loyalty programs, while healthcare offers several unique use cases, ranging from billing to patient record-keeping. Government agencies could also use blockchain to simplify land records, voting processes, government-issued identity numbers, and much more.

In fact, demand from enterprises has been so strong that the Enterprise Ethereum Alliance was formed to provide resources and guidance for enterprises looking to explore blockchain technology. The alliance includes companies such as IBM, Microsoft, Deloitte, and Accenture. Even so, there remains a shallow pool of expert blockchain developers.

William Mougayar, author of "The Business Blockchain," estimated that in mid-2016, there were only "5,000 developers dedicated to writing software for cryptocurrency, Bitcoin, or blockchain in general."⁴ That's a fraction of the overall market, which Mougayar says could include up to 18.5 million software developers worldwide. Industry experts say the talent shortage means blockchain developers can demand higher salaries compared to typical front-end or back-end engineers.

The median income for full-time blockchain developers nationwide is \$140,000, compared to \$105,000 for general software developers, according to a Computerworld article in May 2018. And in tech-heavy regions blockchain developers can command more than \$150,000.⁵ A middleware platform that simplifies DApp development and deployment could help close the blockchain skills gap, empowering companies to cost-effectively and efficiently build and maintain their blockchain apps.

Current blockchain development constraints

As commonly seen in emergent but young technologies, even the most mature blockchain and smart contract platforms still present undesirable friction for developers in several key areas. We have identified some deterrents experienced by a wide selection of developers and businesses that are seeking to understand or implement smart contract, blockchain and digital payment technology.

The Problem With Performance

The prevailing consensus method used in the largest networks has proven itself groundbreaking in several key areas, not the least of which are secure and borderless financial transactions and doing so while achieving and maintaining an acceptably high level of decentralized consensus. Unfortunately these breakthroughs impact the cost and performance in other crucial areas such as write and message times, which are impacted by the time required to achieve immutable consensus.

As a result, it can be challenging for the current generation of public blockchains to offer the scale or performance desired by developers wishing to build truly data-rich, enterprise-scale applications. For example, the current Bitcoin blockchain can only support a maximum bandwidth of about 7 transactions per second. Ethereum supports around 20 transactions per second. Visa, by comparison, can handle up to 24,000 transactions per second.⁶

It is important to mention the emergence of widely deployed PoS and PoA blockchain networks. Although impressive in their ability to maintain comparatively fast blocktimes in contrast to other large PoW blockchains, Ethereum, with a limit of 20 transactions per second, does not provide the capacity necessary for a global payment system, much less a global IoT and enterprise application backbone. By using a PoA mechanism where consensus is determined without the time and energy costs associated with brute force hashing, the initial release of the VeChainThor network is projected to surpass 10,000 transactions per second.

Difficulty Integrating with Real-World, Legacy, and Off-Chain Data

In most businesses only a tiny subset of data will reside on a blockchain or be provided by one or more smart contracts. To address a comprehensive selection of real world business concerns, applications need the ability to interact with data that spans multiple blockchains, smart contracts, legacy databases, oracles and various external sources. Espresso provides tools to aggregate data from these various sources as well as a convenient data access API to reduce the complexity of writing applications that depend on blockchain-resident data.

Knowledge Barriers

Cryptography Is Hard

Cryptography is a very deep field and most, if not all blockchain, smart contract, and cryptocurrency platforms use advanced cryptography. This can be challenging even for seasoned developers. Evidence of this can be seen in several notable blockchain projects that have contained varying levels of flawed cryptography which have exposed the projects and their users to risk and financial loss.

Interacting With The Code Requires Extensive Systems Programming Knowledge

The majority of prevalent blockchain and smart contract platforms are built upon back end software languages such as Go, Rust, and C++. As most of these projects have not matured to the point of delivering refined tooling in the form of graphical interfaces and higher level languages libraries for Javascript, Ruby Python, C# etc., powerful development on these platforms can be challenging or nearly impossible for front end and light client developers.

Lack of DevOps Experience

Complex applications require elaborate and powerful platform configurations. If you want to deploy a DApp and provide a public blockchain node or API that allows it to perform to the best of its ability, you will need to deploy and configure one or more large servers running the blockchain node and or middleware API software. As a network or application increases in complexity, new concerns and service requirements arise – posing a challenge for developers or businesses lacking DevOps resources.

The Espresso Solution

Espresso seeks to level the playing field in blockchain and smart contract development by providing a comprehensive ecosystem which includes SDKs in popular developer friendly languages, API services to provide access to the leading public and private blockchain networks, a library of easy-to-deploy smart contracts, convenient access to real world data via oracles and more.

The Espresso Approach

Blockchain Agnostic

Our middleware and developer ecosystem consists of a library of SDKs that can enable easy access to various blockchains and smart contract platforms. VeChainThor, Ethereum and other Solidity-compatible networks will be among the first of these blockchains. Additionally, we are continuously evaluating additional next-generation blockchain platforms to support based on our customers' needs.

Serverless approach

Many Javascript and mobile application developers want a serverless approach to accessing the data their applications depend on. These developers may not want or know how to work directly with the Ethereum C++, Go, Rust or JSON-RPC APIs. To empower these developers, we will offer a caching and cross chain aggregation layer that consolidates data sources into an idiomatic REST/GraphQL API.

Competition

There are a number of potential competitors to Espresso that offer blockchain-aware, rapid application development solutions, including:

- Visual DApp builders and management services such as Nebula
- Blockchains written in Javascript and other languages commonly found in enterprise orgs such as Stratis, Lisk, Ark etc.
- Oracle services that feed real world data to smart contracts and DApps

Espresso's focus on tooling, data aggregation, and caching is a key differentiator. Unlike other solutions, Espresso provides simple-to-use middleware libraries with integrated smart contract management and high availability data access aimed at all levels of developers across multiple blockchains.

The Path to Espresso

Espresso is built by the team that founded CampusTap, a leading career networking platform for education institutions and corporations incorporated in 2013. CampusTap served over 70 organizations and reached over 1 million users across the world.

One of blockchain's most powerful potential use cases is the ability to create a single, secure digital identification that users can control. In our work with CampusTap, we recognized an opportunity to replace our existing OAuth-based authentication system with one built on the blockchain so that, over time, all current and future CampusTap users would have a digital identity on a blockchain-based system.

However, when prototyping the proof of concept, we found blockchain development inaccessible to our JavaScript development team. We also recognized the limitations of running a data-rich application like CampusTap on public blockchains like Ethereum, which offers limited bandwidth. That led to the idea behind Espresso, and our mission to create an easy-to-use middleware platform that enables developers to build blockchain-based apps quickly.

Espresso's Users

Developers

Developers responsible for building products likely do not know how to set up blockchain servers. These developers may have smaller budgets and would probably otherwise use centralized database solutions, such as Firebase or Realm and run their application on Heroku or Digital Ocean.

Developers will be able to leverage Espresso's intuitive web interface, command line tools and API layer to rapidly prototype decentralized applications. Leveraging Espresso's "blockchain in a box" approach they can focus on development rather than the complexities around consensus and network configurations.

Small Businesses and Startups

Entrepreneurial business owners and founders may be self-educated in the blockchain space and may be price sensitive, with moderate budgets. They may be considering holding a token sale and may want an expedited path to setting up blockchain-based apps and smart contracts, or are looking to sign off on a DApp deployment solution recommended by a developer. Small businesses and startups may have limited in-house DevOps resources; setting up and managing Blockchain servers and database infrastructure internally is challenging.

Espresso is an optimal solution for startups with lean resources, as they will be able to leverage pre-built smart contracts and example apps to quickly conceptualize and build their projects. Organizations looking to run a token sale will be able to quickly build a fully functional product. Espresso will enable them to cut back on development time and focus on core business functions. Non-technical founders can also benefit from monitoring app performance and adoption through Espresso's dashboard.

Enterprise and Government

Attracted to the benefits of blockchain, enterprise and government agencies are researching and experimenting with blockchain products, especially where improved multi-party collaboration around trusted data can replace error-prone, cumbersome legacy systems. Supply chain, financial services, healthcare and real estate companies are just a few that are exploring blockchain solutions, though extensive research and prototyping are needed to get buy-in.

Enterprise development teams will be able to quickly prototype DApps with Espresso's SDKs and smart contract templates. This can also ease the burden of needing to hire hard-to-find blockchain developers. The Espresso dashboard will also provide visibility into Dapp performance for reporting to stakeholders. In addition, Espresso's consulting team could help scope and prototype applications to help ease organizations into the blockchain space without the need to engage in multi-year contracts with large consultancies.

Use Cases

With Espresso, developers can build DApps for real estate escrow deals, payment platforms, custom crypto tokens, IoT sensor tracking, voting, and betting, to name a few applications.

As an example, Sarah wants to create a token (KNOW) on the VeChainThor Blockchain that rewards experts for contributing knowledge in various fields of study and professional focus. She intends to build her own community apps for iOS, Android and the web, and she also plans to build “tip bots” for Reddit, Telegram and Twitter. Her goal is to get her knowledge transfer token onto an exchange so experts can receive monetary rewards for sharing knowledge across a variety of social networks and even in person.

Using Espresso’s web-based platform, Sarah chooses a crypto token contract from Espresso’s library of premade configurable smart contract templates. The platform presents a simple form, where she enters the smart contract details including the token name, token symbol, token supply, etc. She presses a button to deploy the contract, and the token gets deployed to the VeChainThor network.

Sarah has a small development team to build her knowledge community apps for iOS, Android and the web. After deploying her token contract, the team decides not to keep all the social interaction data on the blockchain, as it would cost too much and would likely be edited and updated frequently – every time users ask a question or post an answer, for example.

Her development team uses Espresso’s Swift and Javascript libraries in their mobile and web apps to interface with Espresso’s easy object storage and smart contract API. This allows them to intermingle off-chain social data with blockchain resident data, execute various smart contract functions, and incorporate real-world data provided by oracles, all in one place with a consistent API across various devices.

In addition, to provide the best user experience, Sarah wants to run processes to manage things like notifications, AI-based user matching, ensure that profanity and obscene content is swiftly removed and more. The developers decide to write the user notifications processes in Java using direct access to the REST API endpoints. So they pull the data in using a standard Java HTTP library and deserializing JSON. The team managing suggestions and notifications wants to leverage the extensive AI/ML libraries available in Python. To do so they use the Espresso Python SDK to obtain the raw data from the API, which they process for profanity and sentiment detection, tag and update in their apps data repository. Meanwhile, Sarah can log into the Espresso dashboard to see app usage statistics to monitor engagement across her mobile & web apps, as well as any bots and backend processes that she has granted access to.

Token Model

In today's general software market, our approach can be compared to offerings such as platform-as-a-service (PaaS) or blockchain-as-a-service (BaaS). Espresso's EZPZ tokens will be used to validate data transactions, meter usage and enhance security. Additionally, EZPZ tokens can be used for Espresso's marketplace, enabling developers to activate pre-built Espresso smart contracts and third-party components to create innovative blockchain solutions.

Espresso will provide hosting and consultancy for DApps built to connect to Ethereum, VeChainThor and other blockchains. Espresso will work closely with businesses to determine their business goals before deploying nodes, if required, and organizing hosting. This allows developers to focus solely on creating applications without spending time and resources on infrastructure.

Roadmap

Q3 2017 - Complete

- Build Elixir Ethereum integration
- Internal and Ethereum API integration

Q4 2017 - Complete

- Build authentication library
- Launch position paper, website, and video
- Initiate community engagement through blog, speaking engagements, and public relations
- Legal: finalize entity formation and Purchase Agreement details

Q1-Q2 2018

- Deploy internal Testnet
- Identify key features for middleware
- Design UI/UX for Middleware SaaS offering
- Smart contract research
- Integrated KYC platform into Espresso
- Launch Private Sale

Q3 2018

- EZPZ Token Presale
- Build and test smart contract creation/management interface
- Launch EZPZ smart contract with Espresso on VeChainThor
- Announce new strategic partnerships
- Host blockchain education events
- EZPZ Token Public Sale

Q4 2018

- Beta access to Espresso Core & Developer Portal
- Explore additional blockchain integrations
- Token Generation Event

2019

- Public launch of Espresso Core & Developer Portal
- Launch 3rd party Espresso Marketplace
- Interface with additional leading blockchain solutions
- Develop SDKs for additional programming languages
- Add Oracle support to create an interface to external data systems

Espresso Technical Overview

We are taking a new approach to building a secure and developer friendly next-generation application ecosystem.

The Espresso Ecosystem

The Espresso Ecosystem is a collection of commercial and open source tools and services which provide a comprehensive rapid application development environment.

Espresso Core

Espresso Core is a distributed data protocol comprised of a fabric of independent sidechains that contain compressed graph data. We designed this primarily to sustain a high transaction throughput and to cryptographically ensure data integrity across the network.

Espresso Wallet

Espresso Wallet is a web-based digital wallet for EZPZ tokens. The wallet will allow EZPZ holders to pay network fees and can be used to abstract value to pay for various platform fees.

Espresso Upcoming Offerings and Examples

Application composer BaaS platform

Simple authentication API and SDK network client wrapper libraries

- Espresso Javascript SDK
- Espresso Elixir SDK
- Espresso Ruby SDK

Light wallet desktop UI

GraphQL API for ephemeral sidechain configuration, deployment and access

Cross chain state explorer, asset exchange and metadata API/SDK

Espresso Core

A cryptographically secured sidechain fabric protocol

Espresso Core is the main peer-to-peer network node software that manages a global token ledger and a fabric of immutable yet ephemeral sidechain data. This is commonly referred to as a “full node” or “daemon,” and is responsible for data storage, transaction management, network communication, and consensus participation.

Design Reasoning

At the core of every blockchain network is some variation of a consensus based, cryptographically secured, immutable, tamper evident ledger. This usually includes a unit of value exchange which serves to:

1. Prevent network abuse by imposing a small fee on ledger transactions
2. Ease the transfer of intra-domain computational resources,
3. Demonstrates stake in the system
4. Incentivize participation and the dedication of computational resources to the network

After researching the characteristics and behavior of the most prevalent blockchain and Directed Acyclic Graph (DAG) based projects, we concluded that the best path forward is to design our core blockchain server from scratch using the tools and processes that will best suit the goals of our platform. We have identified some core requirements that are not found or under-delivered in existing projects.

Some but not all, of these requirements are:

1. Highly available delivery of unstructured, cryptographically secured data
2. Ephemeral and domain specific sidechains that interact with a global account ledger
3. The platform should be built using functional programming language and design principles, including but not limited to strong type definitions, a preference for pure functions and encapsulated state, extensive testing and code linting.
4. Consensus should be based on a combination of weighted stake election and low difficulty proof of work as well as duration and quality of participation.
5. Should address different use cases for UTXO-based ledger and unstructured data storage by having a different data storage format for sidechain data
6. Encryption/obfuscation of unstructured sidechain data when required

Implementation Components

Blockchain Data Storage

One of our core requirements is to have a global ledger that is accessible by any number of sidechains. The core ledger is a Merkle tree data structure based on light proof of work performed by elected stakeholders. We use a standard difficulty-based SHA-3 hash algorithm and blocks are stored sequentially as a chain of Merkle proofs.

Accounts are described and settled using a modified UTXO model. This works well for describing a settlement layer, but not so well for describing unstructured data. Our sidechain fabric is designed to enable rapid read and write access to unstructured data without the need for value settlements. This results in simpler and more performant data access, as well as the ability to easily expire legacy data without impacting the settlement history of the overall system.

Consensus

There are various approaches to achieving and maintaining consensus in a decentralized and volatile network environment with a large number of transient peers and the potential for bad actors attempting to compromise or unduly influence the system.

The prevalent approaches now in use are Proof of Work (Bitcoin and the current generation of Ethereum) and various approaches to Proof of Stake/Authority (VeChain, EOS, ADA, Lisk, and possibly the next generation of Ethereum). Our approach is a hybrid method of Proof of Authority and low-difficulty Proof of Work. This allows us to use a weighted election system and give block forging priority to elected nodes based on their past behavior, performance and economic stake in the system.

Peer-to-Peer Network

To provide a highly available, decentralized data services network and to support the mesh network communication style required by this model, we need a robust and battle-tested networking and execution platform. Based on these considerations, we chose to build the initial implementation on the Erlang Open Telecom Platform.

This language and computing platform combination has performed at scale for 20+ years, originally in telecom as it was designed for and used by Ericsson Labs, and more recently used in large-scale social messaging platforms such as WhatsApp and Discord. Erlang and the Open Telecom Platform are designed around functional programming theory – which, when applied correctly, can help avoid a wide category of bugs and performance issues that are seen in other programming models that lack type enforcement and data encapsulation.

Our peer discovery and overall network model is derived from ideas found in Biased Gossip & Anti-Entropy protocols, and are based on pure Transmission Control Protocol/Internet Protocol (TCP/IP). We use a flood-based propagation model that achieves a near logarithmic change distribution velocity.

JSON-RPC API

To allow developers to build complex applications and integrations, we provide a standard JSON-RPC endpoint incorporated in most cryptocurrency and smart contract blockchain node software. This is how exchanges, wallet software, block explorers, chain analysis engines, and other applications gain visibility into the contents and state of the blockchain data by communicating directly with a full node.

Espresso REST and GraphQL APIs

This is the service layer used by our management consoles, wallets, DApp management console and other end user tools. Documentation and examples of http calls and responses will be posted on our Github.

Our developer SDKs are available in a variety of popular programming languages for both front-end and back-end development. And, of course, the JSON-RPC API can be accessed directly by constructing the network calls manually. In the future we are planning to add a socket-based subscription API so clients can receive event-based data updates as passive push notifications.

Any public function useful to an application developer should be available using this interface, and additional sensitive functions should only be exposed via internal IPC whenever possible.

Conclusion

By combining purpose-driven insight and extending ideas found in blockchain technologies, we are creating a specialized and performant distributed network that offers many of the benefits that have drawn developers and users to the blockchain and distributed computing space. This core platform will help accelerate adoption of these technologies in the real world and accelerating the future of decentralized, fault-tolerant, egalitarian networks.

Espresso Token Sale Details

Espresso is working to make decentralized app development and thus blockchain technology adoption more accessible with a platform designed for developers, enterprises and organizations looking to build data-rich web and mobile apps that interoperate with leading blockchains and smart contract platforms. The use of EZPZ on our platform is vital for validating transactions across various public blockchains. EZPZ will also be used for abuse mitigation, as a value transfer utility, and to acquire resources from integration partners core to our developer offering.

We started the first round of the Token Generation Event (TGE) with the Private Funding Round on June 22nd, 2018. Dates for the VeChain Community Round and the Public Round will be announced soon.

As a VeChain Foundation officially-backed New Token Issuance, Espresso has pledged to sale at least 50% of token sale funds in VET. Based on our commitment and trust in the VeChain ecosystem, we intend to hold VET throughout the project's development and only utilize VET for funding in the event that all other financial resources have been exhausted.

All ratios are assumed prior to the VET 1:100 split at mainnet launch. All distributed tokens will be created on the VeChainThor Blockchain and distributed after the mainnet launch. A summary of important details regarding the sale can be found below:

Maximum Token Supply—5,000,000,000

Maximum Token Distribution—1,500,000,000

VET to EZPZ Base Ratio—1:270

Hard Cap—Tokens equivalent to \$15,500,000

Private Sale Start Date—June 22, 2018

VeChain Community Round—Early July (TBD)

Public sale Round—Early September (TBD)

Private Round

The Private Round kicked off on the June 22nd, 2018 and is primarily meant for strategic partners and funds that will be able to offer a long term benefit to the Espresso Platform and its developer community. If you believe you are in this category and would like to be a part of this round, we encourage you to contact us at contact@espresso.io

All Private Round contributors will participate in a required EZPZ token lockup program, with the first 25% of their tokens released a few days after token minting and 25% released every 3 months thereafter.

Private Round Details

Expected Sale—\$6,200,000 in VET

Max Discount—25%

Maximum Ratio for VET to EZPZ—1:337

Maximum Offering—75,000 VET

Minimum Offering—17,000 VET

VeChain Community Round

The VeChain Community Round is dedicated to VeChain X-Node holders and other holders of VET. EZPZ pledges, through the facilitation of the VeChain Foundation, to provide VeChain X-Node holders with access to exclusive tiers of discounts and rights of purchase.

Total Sale—\$3,814,000 in VET

Authority/ Mjolnir X-Node—25% Discount

Thunder X Node—15% Discount

Strength X Node—15% Discount

VeThor-X- 5% Discount

Non-X Node VET issuers—0% Discount

The VeChain Community X-Node Round also includes Economic Nodes. However, X-Node holders are offered discounts and guaranteed contribution to the sale. In addition, X-Node holders will have the first opportunity to obtain EZPZ tokens, while Economic Nodes will be allowed to participate in this round as long as there are allocations still available in the VeChain Community pool. Economic Nodes will also not be eligible for a discount.

The starting date for the KYC/Whitelisting process for the VeChain Community Round will be announced soon. Espresso will ensure that all KYC information gathered during this TGE are stored securely.

X-Nodes will only be recognized by their holding at the time of the VeChain Foundation designated lock period (no maturity period is recognized). In addition, the Foundation will verify the X-Node holders status and identity by cross referencing with the VeChain Foundation's database.

The VeChain Community Round purchasing limits are as follows:

- VeChain X-Node holders: Minimum 300 VET—Maximum 30,000 VET (Per KYC)
- Economic Nodes and other VET holders: Minimum 300 VET—Maximum 3,000 VET (Per KYC)

In the event that whitelisted VeChain Community sale participants request to provide funds in total that eclipses the predetermined \$1,500,000, VeChain Community Round participants will be able to continuously pull from the Public Round pool until the completion of the token sale.

Authority and Mjolnir X members that receive the largest discount will participate in a required EZPZ token lockup program, with 25% of their tokens released a few days after token minting and 25% released every quarter thereafter.

There is no lock up for Thunder X, Strength X, VeThor X, Economic Node and other VET holders.

Public Round

The Public Round will begin as soon as the VeChain Community Round concludes. There will be no discounts offered during the Public Round.

There is no lockup for the public round.

KYC is required for the Public Round. The starting date of the KYC for the public round will be announced soon.

The Public Round purchasing limits are as follows:

- All participants: Minimum 100 VET—Maximum 1000 VET (Per KYC)
- Total Sale in Dollars—\$4,160,000
- VET to EZPZ Ratio—1:270

Token Structure

The maximum supply of 5 billion tokens will be created.

Tokens to be Sold—30%

- Private Sale—6%
- Pre-Public Sale—9%
- Public Sale—15%

Additional Token Breakdown—70%

- Team—15%
- Future Partners—10%
- Community—10%
- Business Development—10%
- Research and Development—10%
- Treasury & Reserve—10%
- Advisor—5%

Community

10% of the token supply will be used to incentivize our most dedicated community members for contributing to the project and expanding the platform.

Advisors

5% of the token supply is to be used as incentives alignment mechanism for influencers and advisors.

Business Development

10% of the token supply will be used for business development in the form of key stakeholders that are connected to Espresso.

Team and Founders

15% of the token supply is reserved for the core contributors. These tokens will be distributed based on a merit system and at the discretion of the executive team. The lockup period of these tokens will be 24 months.

Reserved Future R&D & Operations

10% of the token supply will be reserved for future development of the Espresso platform and correlating Ecosystem.

Treasury and Reserve

10% of the token supply will be reserved in case of emergency.

OTHER TGE DETAILS

Contributions

During the presale we will accept fiat (non-cryptocurrency) and cryptocurrency (ETH, BTC, Litecoin, Zcash, etc.). We will accept VeChainThor (VET) contributions during the TGE only. Other tokens will need to be converted to VET. Additional instructions will be provided on the Espresso website.

Founding Token Allocation

Tokens will be allocated directly to founding company-owned accounts, and not to individuals.

Accreditation and KYC/AML Checks

All token purchasers must fill out the appropriate investor accreditation forms and clear KYC/AML verifications for both presale rounds. Exact forms will be available upon the start of the token sale.

More Information

Visit espresso.io to sign up for our newsletter and receive updated information as soon as it is available.

Telegram: [Announcements Channel](#) & [Discussion Group](#)

General Inquiries: contact@espresso.io

Token sale questions: contact@espresso.io

Espresso Managing Team



Remy Carpinito - CEO & Founder

Remy Carpinito is the founder and CEO of Espresso and formerly CampusTap, a private networking and alumni mentoring platform. He successfully raised \$3M from Angels and VCs. Prior to founding Espresso Remy founded an EdTech company, CampusTap, which serves students and alumni within 50+ universities across the United States. Remy has been invited to speak on numerous blockchain panels globally and recently was part of a global blockchain Blockchain and FinTech delegation that toured 4 major cities in China.



Alan Wilhelm - CTO & Founder

Alan is a proponent of decentralized computing and finance and has worked with, and contributed to several popular open source blockchain projects. At Espresso he leads software development, platform architecture and technology strategy. Alan has 15+ years of software engineering experience. Before Espresso, Alan was a DevOps and Data engineer at RadiusIntel, Citeline and Electronic Arts.



Craig Gainsboro - CFO

Craig is an accomplished CFO with a concentration in technology, professional services, manufacturing, blockchain and distribution companies. He is the former US CFO for the Tax and Advisory services lines of service for PricewaterhouseCoopers LLC which accounted for \$2.4bn and \$2.2bn of annual revenues, respectively. After leaving PwC Craig founded Ignition Consultants, a fractional CFO consulting practice which has assisted founders and CEOs in raising over \$500mm of venture equity and debt.

Espresso Advisors



Sunny Lu

Sunny has served as the IT Executive in Fortune 500 companies for over 13 years and was the former CIO of LV China. In 2015 he Co-Founded the VeChain project and became the CEO of the VeChain Foundation. Sunny graduated from Shanghai Jiao Tong University, majored in Electronics and Communication Engineering.



CREAM

CREAM is an enterprise executive advisory and merchant bank. We work in partnership with executive teams to widen strategic horizons, assist with token strategies, expand community outreach and brand exposure.



Rob Dolci

Rob is President and CEO of Aizoon USA, an international technology service company that focuses on Smart Factory (Industry 4.0), Cyber Security, and industrial automation. Rob is a recognized technology executive and helped Aizoon achieve the Cool Vendor Award from Gartner in 2016 for IoT. On completion of an MBA (concentration in System Dynamics) at Strathclyde University in Glasgow, Rob moved into Information Technology and spent 15 years progressing to Chief Information Officer (CIO) in Automotive, Machine Manufacturing and Supply Chain Industries. Rob has a professional certification in Cybersecurity from the Computer Science and Artificial Intelligence Lab (CSAIL) of MIT in Boston.



David Fragale

David is Co-Founder and Chief Product Officer of Atonomi, a blockchain-based security protocol enabling trusted interoperability for billions of IoT devices. In 2014, David was appointed as an MIT Sloan Fellow in Innovation and Global Leadership, focusing on innovation and emerging technology trends such as FinTech, Cryptocurrencies and Blockchain. Previously, Dan led multiple projects at PwC for Fortune 500 companies, multilateral organizations and the public sector. While there he advised U.S. Treasury's TARP program during the height of the financial crisis, published numerous white papers and articles, and has spoken at conferences and events on blockchain technology and his experiences.

Espresso Advisors



Eileen Quenin

Eileen is the VP Strategic Partnerships of the Dragonchain. She spent 7 years at The Walt Disney Company as a Tech Evangelist and core team member of the Dragonchain project. She was instrumental in gaining approval to open source the platform. The project was nominated for a Best of Disney Award in 2016. She was part of Amazon Global Payments and Transaction Risk Management teams. There, she was involved in product development for gift cards, Amazon Pay, PayPhrase, and Amapedia. She and her team hold a patent on intelligent and firm currency conversion. Which allows a currency preference for a user and conversion of monetary values to the preferred currency for transactions entered into by the user. She has previous experience at AT&T, Microsoft, GE, Healthcare, and LexisNexis.



Dr. Mihaela Ulieru

Professor Ulieru is a Blockchain Champion at the World Economic Forum where her advocacy resulted in the technology being included among the Top Ten in 2016. Her groundbreaking research in distributed intelligent systems created a strong foundation for governance on blockchain as an institutional technology after it revolutionized manufacturing, logistics, and homeland security. Prof. Ulieru, a California Berkeley Alumna, has held and holds appointments to boards and councils including the Science and Engineering Research Council of Singapore, the Canadian Science Technology and Innovation Council, the European Commission Research Program, and the Global Agenda Council of the World Economic Forum.

LEGAL DISCLAIMER

This White Paper is for information purposes only and may be subject to change. We cannot guarantee the accuracy of the statements made or conclusions reached in this White Paper and we expressly disclaim all representations and warranties (whether express or implied by statute or otherwise) whatsoever, including but not limited to:

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We shall have no liability for damages of any kind arising out of the use, reference to or reliance on the contents of this White Paper, even if advised of the possibility of damages arising. This White Paper may contain references to third party data and industry publications. As far as we are aware, the information reproduced in this White Paper is accurate and that the estimates and assumptions contained herein are reasonable. However, we offer no assurances as to the accuracy or completeness of this data. Although information and data reproduced in this White Paper are believed to have been obtained from reliable sources, we have not independently verified any of the information or data from third party sources referred to in this White Paper or ascertained the underlying assumptions relied upon by such sources.

As of the date of publication of this White Paper, EZPZ Tokens have no known or intended future use (other than on Espresso platforms, as more specifically defined in this White Paper).

No promises of future performance or value are or will be made with respect to EZPZ Tokens, including no promise of inherent value, no promise of continuing payments, and no guarantee that EZPZ Tokens will hold any particular value. Unless prospective participants fully understand and accept the nature of Espresso's business and the potential risks associated with the acquisition, storing and transfer of EZPZ Tokens, they should not participate in the EZPZ TGE. EZPZ Tokens are not being structured or sold as securities or investments. EZPZ Tokens hold no rights and confer no interests in the equity of the company. EZPZ Tokens are sold with an intended future functionality and utility on Espresso's platforms and all proceeds received during the TGE may be spent freely by Espresso as set forth on the development of its business and the underlying technological infrastructure.

This White Paper does not constitute a prospectus or disclosure document and is not an offer to sell, nor the solicitation of any offer to buy any investment or financial instrument in any jurisdiction. EZPZ Tokens should not be acquired for speculative or investment purposes with the expectation of making an investment return.

No regulatory authority has examined or approved any of the information set out in this White Paper. No such action has or will be taken under the laws, regulatory requirements or rules of any jurisdiction. The publication, distribution or dissemination of this White Paper does not imply that applicable laws or regulatory requirements have been complied with.

Participation in the TGE and any pre-sales carries substantial risk and may involve special risks that could lead to a loss of all or a substantial portion of your contribution. Further information about the risks of participating in the TGE and the pre-sales are set out in the Offering Memorandum. Please ensure that you have read, understood and are prepared to accept the risks of participating in the TGE and the pre-sales before sending a contribution to us.

The pre-sales, the TGE and/or EZPZ Tokens could be impacted by regulatory action, including potential restrictions on the ownership, use, or possession of such tokens. Regulators or other competent authorities may demand that we revise the mechanics of the pre-sales, the TGE and/or the functionality of EZPZ Tokens in order to comply with regulatory requirements or other governmental or business obligations. Nevertheless, we believe we are taking commercially reasonable steps to ensure that the pre-sales, the TGE and issue of EZPZ Tokens do not violate applicable laws and regulations. The EZPZ allotments for the pre-sales and the TGE in this White Paper are preliminary and subject to change.

CAUTION REGARDING FORWARD-LOOKING STATEMENTS

This White Paper contains forward-looking statements or information (collectively “forward-looking statements”) that relate to our current expectations of future events. In some cases, these forward-looking statements can be identified by words or phrases such as “may”, “will”, “expect”, “anticipate”, “aim”, “estimate”, “intend”, “plan”, “seek”, “believe”, “potential”, “continue”, “is/are likely to” or the negative of these terms, or other similar expressions intended to identify forward- looking statements. We have based these forward-looking statements on current projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy, financial needs, or the results of the Token Sale.

In addition to statements relating to the matters set out here, this White Paper contains forward- looking statements related to the EZPZ Digital Networks proposed operating model. The model speaks to our objectives only, and is not a forecast, projection or prediction of future results of operations.

Forward-looking statements are based on certain assumptions and analysis made by EZPZ Digital Network in light of its experience, current conditions and expected future developments and other factors it believes are appropriate, and are subject to risks and uncertainties. Although the forward-looking statements contained in this White Paper are based upon what we believe are reasonable assumptions, there are risks, uncertainties, assumptions, and other factors which could cause EZPZ Digital Network’s actual results, performances, achievements and/or experiences to differ materially from the expectations expressed, implied, or perceived in forward-looking statements. Given such risks, prospective participants in the Token Sale and any pre-sales should not place undue reliance on these forward- looking statements.

Endnotes

- 1 Bitcoin Energy Consumption Index, <https://digiconomist.net/bitcoin-energy-consumption>
- 2 “Banking on Blockchain”, Accenture, <https://www.accenture.com/us-en/insight-banking-on-blockchain>
- 3 “Beyond bitcoin: Blockchain is coming to disrupt your industry”, Deloitte Insights, <https://www2.deloitte.com/insights/us/en/focus/signals-for-strategists/trends-blockchain-bitcoin-security-transparency.html?id=us:2el:3dc:dup1381:eng:dup:dcpr>
- 4 “The Blockchain Developer Shortage: Emerging Trends and Perspectives”, Bitcoin Magazine, <https://bitcoinmagazine.com/articles/the-blockchain-developer-shortage-emerging-trends-and-perspective-s-1477930838/>
- 5 “Blockchain moves into top spot for hottest job skills”, Computerworld, <https://www.computerworld.com/article/3235972/it-careers/blockchain-moves-into-top-spot-for-hottest-job-skills.html>
- 6 “Bitcoin and Ethereum vs Visa and PayPal - Transactions per second”, My Broadband, <https://mybroadband.co.za/news/banking/206742-bitcoin-and-ethereum-vs-visa-and-paypal-transactions-per-second.html>

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