A blockchain supported network for programmable information

hey@dispatchlabs.io

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Abstract:

Dispatch is a business-ready blockchain protocol which adds a fundamental class of functionality to blockchain by integrating the management and distribution of off-chain artifacts, or programmable data – all managed by the Dispatch Artifact Network (DAN). The Dispatch blockchain is a shared ledger that grows linearly while the data managed by the chain grows exponentially. Dispatch enables the decentralized management of data storage, allowing for Dapps that build and run operations on the access, distribution, and manipulation of that data.

Dispatch solves for transaction speed and size scalability issues with a combination of existing and new protocols. Dispatch uses Delegated Proof of Stake (DPoS) to establish consensus, and introduces the Dispatch Virtual Machine (DVM) to allow the creation and execution of stateful programs using the blockchain's shared state. The DVM enables the execution of smart-contracts to handle artifact operations, and lets Dapp developers build apps that require both the storage of data, and the running of operations on that data. Data is stored within the Dispatch Artifact Network (DAN), which combines a Kademlia DHT for node data management and Proof-of-Replication (PoRep) to ensure trust and verify data transfers. Data is managed off-chain via the Make-it-Happen (MiH) protocol, and governed and verified by Proof-of-Retrievability (PoR).

Dispatch is a fundamental evolution in blockchain technology. Dispatch's architecture facilitates many use cases which are not possible on existing blockchains. Content Delivery Networks, streaming services, peer-to-peer marketplaces, and big data analytics are just a few of the use cases which will now be able to transition to blockchain with Dispatch. Dispatch is both a decentralized network where Dapp developers or individuals can sell, distribute, or store files, content, information, and data, and a framework for future data intensive computational applications.

Contents

1. Introduction

Dispatch is a blockchain protocol for the distribution, sale, manipulation, or storage of large amounts of data that would otherwise be unstorable in a shared ledger. By making data programmable, Dispatch opens up a variety of use cases by enabling not just storage, but computations to run on data which is managed in the shared ledger. The primary goal of Dispatch Labs is to dramatically improve the utility of information by building a blockchain where the shared ledger grows linearly while the information tracked by the blockchain grows exponentially. By empowering distributed application (Dapp) developers to control large amounts of data via smart contracts, Dispatch enables an infinite number of use cases in fields ranging from big data to file systems.

1.1. Scalability limitations of blockchain

Blockchain technology functions as a distributed ledger, with every user owning an identical copy. Most blockchains grow slowly because charges are incurred for writing data to the blockchain, but this solution makes storage of large amounts of information impracticable. And as the size of the shared ledger grows larger and larger, it will still eventually outgrow the storage capacity of the typical node. When only a shrinking number of nodes can afford to store the shared ledger, we face the problem of *recentralization*.

The scalability issues that face blockchain technology are a hot topic among some of the most prevalent and influential experts in the field. Each proposed solution comes with its own set of merits and costs. Core developers of Bitcoin and Ethereum are working on sharding existing blockchains, so that nodes in the network hold onto just a subset of the ledger and verify just a subset of the transactions[1]. While sharding is a viable way of continuing to support the current model of *pay per size* transactions, it still doesn't allow for the extended functionality of larger data storage. Extending the functionality and scalability of existing blockchain technology to

[1] Zamfir, Vlad. "Sharding the Blockchain." Diyhpl.us, 29 Mar. 2017, diyhpl.us/wiki/transcripts/scalingbitcoin/sharding-the-blockchain/.

handle the storage and transfer of data and files will drastically increase the potential use cases and adoption of blockchain by both consumers and enterprises.

1.2. Introduction to the Dispatch solution

In less than 10 years, the combined market cap of cryptocurrencies built on blockchain technology grew from $0 to over $500 Billion[2]. This monumental growth is accelerated by the continued development of blockchain functionality like the ease of development of programmable state via smart contracts introduced by Ethereum[3]. Dispatch Labs seeks to further the functionality of blockchain technology to enable business ready applications and contribute to the research of the blockchain community as a whole. Using an integrated distributed file system, the Dispatch protocol brings the continued expansion of blockchain functionality into fruition.

Dispatch is a new blockchain protocol that utilizes the trustless and cryptographically secure exchange of off-chain *artifacts* to advance the utility of information. Files, datasets, Merkle trees and more can be tracked on the shared ledger, while the actual storage and access to read and write those artifacts are controlled via smart contracts. The Dispatch distributed ledger runs in parallel with the *Dispatch Artifact Network (DAN)*, so the ledger can track the state and validity of the artifact. Network participants earn Dispatch tokens as *elected witnesses* by offering compute to validate the blockchain, as *farmers* by offering their storage and bandwidth to host and serve the artifacts, or some as combination of each. The token is used by *uploaders* to write to the shared ledger and pay farmers for storage and by *downloaders* to buy permissions to access certain artifacts.

The *Dispatch Virtual Machine (DVM)* supports smart contracts written to the blockchain just like the Ethereum Virtual Machine (EVM), but extends the instruction set to support actions taken in

[2] “Cryptocurrency Market Capitalizations.” CoinMarketCap, coinmarketcap.com/.

[3] Witherspoon, Zane. "Advancing Consumer Adoption of Blockchain Applications." arXive, Cornell University Library, 12 May 2017,

the artifact network like storage and transfer. The result is that Dispatch smart contracts can be used to programmatically set access to artifacts based on parameters like time, price, and user groups. User's access to the artifacts is written directly to the contract's state in the shared ledger. Adding programmable access to off-chain artifacts to the existing blockchain technology of programmable shared state enables businesses and developers to make Dapps that were never before possible in a single framework.

1.3. Sample Use cases

Peer-to-peer content marketplace

Where iTunes typically takes about 30% of each song sold[4], artists selling their music through the Dispatch network could keep up to 100% of their sale. And since Dispatch doesn't discriminate based on file types, content creators can sell their art, movies, books, software, VR assets, secret documents, and more.

Open market CDN (Content Delivery Network)

The Dispatch network runs on a global network of farmers hosting and distributing data on behalf of the uploaders who added them to the network, making it a de-facto CDN. The uploaders can leave their content with as many farmers as they see fit based on the size and demand of the file. And since there's not just one company to set the price of the file hosting, the farmers are actually bidding against each other to host the files for the lowest possible price.

eLearning

Curriculum management, video or written lessons, research material distribution could all be stored in the Dispatch network. Tests could be given in the blockchain and grades could be stored immutably. Class workflow can be programmatically configured, so a student could programmatically unlock access to the next lesson based on their grade in the previous chapter.

[4] Dredge, Stuart. "How Much Do Musicians Really Make from Spotify, ITunes and YouTube?" The Guardian, Guardian News and Media, 3 Apr. 2015.

Token sales

Developers can use Dispatch smart contracts to create data-oriented Dapps on top of existing smart contract functionality like tokens. If the developers of a Dispatch Dapp are seeking funding for their project, it would make sense for them raise at least some of their funds through the Dispatch blockchain. By accepting Dispatch in their token sales, businesses can also accept support from the community that their Dapp is built on.

2. Technical Specifications

The Dispatch network is a system to build practical Dapps that, like many traditional apps, incorporate storage as well as compute. This section outlines specific building block protocols and the overarching system architecture that makes up the functionality of the Dispatch network.

2.1. Technical Overview

The Dispatch network is a composition of new and established protocols being used in some of the most widely adopted distributed systems today. Consensus is established via the *Delegated Proof-of-Stake (DPOS)* algorithm used by Bitshares[5], Steemit[6], and EOS[7]. The *Dispatch Virtual Machine (DVM)* is based on the Ethereum Virtual Machine[8]. Artifacts and nodes are tracked using a *Kademlia* distributed hash table (DHT) similar to Storj[9] and IPFS[10]. All these pieces work together with off-chain operability protocols developed by Dispatch Labs to create a system with more expansive Dapp functionality than any before it. Below is a high level diagram of the Dispatch infrastructure.

[5] https://bitshares.org/technology/delegated-proof-of-stake-consensus/

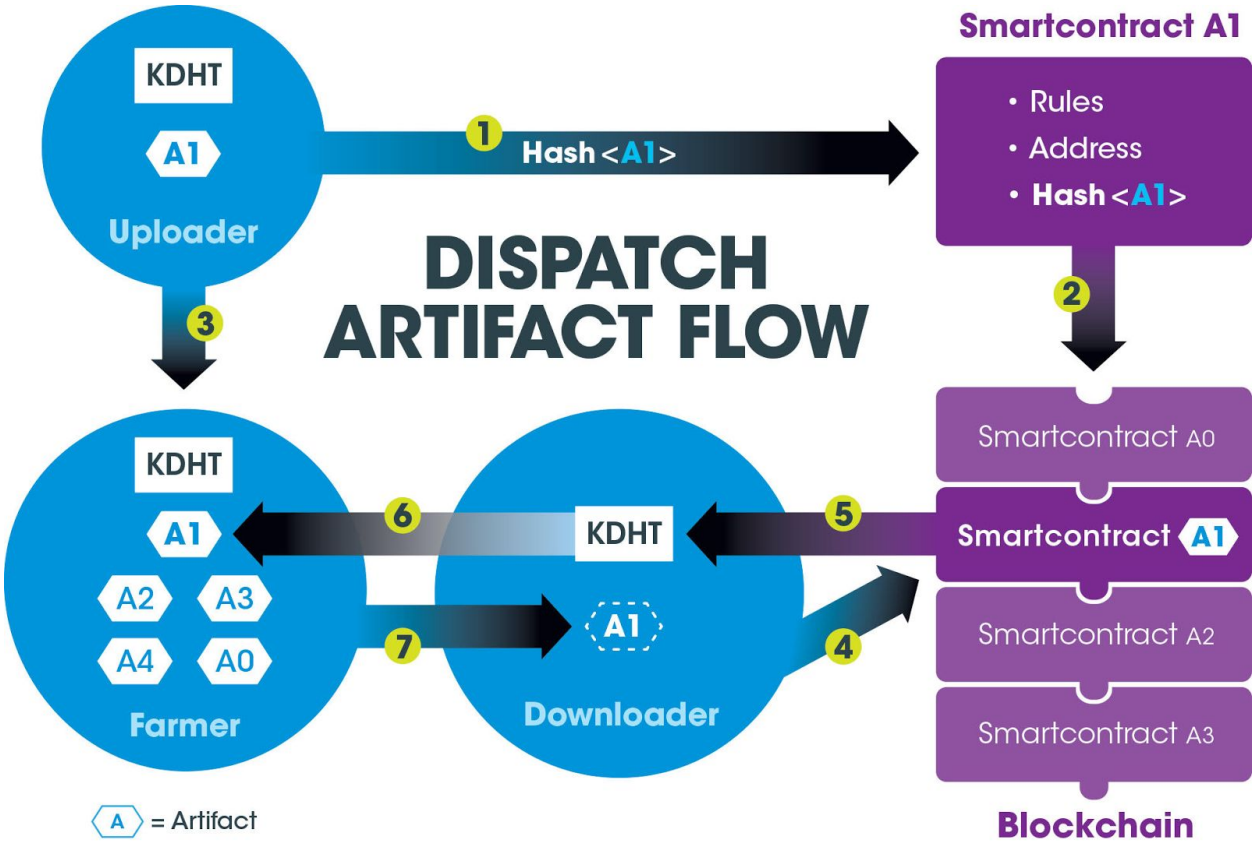
[6] https://steemit.com/dpos/@dantheman/dpos-consensus-algorithm-this-missing-white-paper

[7] https://github.com/EOSIO/Documentation/blob/master/TechnicalWhitePaper.md

[8] https://github.com/ethereum/wiki/wiki/White-Paper

[9] https://storj.io/storj.pdf

[10] https://github.com/ipfs/ipfs



The uploaders, farmers, and downloaders are nodes, each with their own Kademlia DHT, an identical copy of the shared ledger, and a various number of artifacts. The Dispatch blockchain runs a DPOS consensus algorithm that uses elected witnesses to mint blocks, effectively bringing transaction times down to one second and transaction costs close to zero.

The flow of a Dispatch Dapp starts with uploader publishing an artifact to the network. To do so, the uploader creates a smart contract containing a hash of the artifact and rules for accessing it (1). Hashing the file serves the dual purposes of reducing the amount of data written to the shared ledger and keeping the artifact itself unknown to other nodes in the network. Rules for accessing the artifact can be based on time, price, user group, oracles, etc. Once the smart contract is published to the shared ledger (2), anyone can request the artifact from the uploader.

Downloaders will know they received the right artifact when the hash of what they received matches the one in the shared ledger.

Uploaders can pay farmers to serve encrypted copies of their artifacts (3) to service more downloaders and to mitigate downtime. Farmers are compensated for their storage as well as their bandwidth. When a downloader wants an artifact (4), they can check their Kademlia DHT (5) to find the closest available farmer (6). When downloading an encrypted artifact from a farmer (7), the downloader will still need the much smaller encryption key from the uploader.

2.2. Actors and roles

There are several different roles a node can play in both the blockchain consensus and the Dispatch Artifact Network (DAN). The roles necessary for DPOS consensus are the (1) stakeholders, (2) elected witnesses, and (3) elected delegates. In the DAN, nodes can act as the (4) uploader, (5) downloader, or the (6) farmer. None of the roles are mutually exclusive, meaning that any node can take on any number of roles in its network interactions.

Stakeholders

In any Proof-of-Stake (PoS) system, there must be stakeholders and Delegated Proof-of-Stake is no different. A stakeholder is any node who holds Dispatch tokens. Stakeholders are in charge of electing the witnesses and the delegates. Stakeholders get one vote per share per candidate in each election.

Witnesses

The witnesses in a DPOS blockchain are the nodes in charge of producing new blocks. The number (N) of witnesses is defined such that at least 50% of voting stakeholders believe there is sufficient decentralization. Once the witnesses have been elected for a round, their order is pseudo-randomly shuffled and they are given specific one second time slots to produce their

block. Witnesses are given a block reward for each valid block they produce, and a block has receive approval from *2/3(N) + 1* witnesses to be considered valid.

Delegates

Just like witnesses, delegates are elected by the stakeholders. An elected delegate can propose and vote changes to the parameters of the network like transaction fees, to block sizes, witness pay, and block intervals, etc. After the majority of delegates have approved a proposed change, the stakeholders have a review period during which they may vote out delegates and nullify the proposed changes. This ensures that even in the case of corruption among the elected delegates, the strength of the system is still in the hands of the stakeholders.

Uploaders

Uploaders seed the DAN with artifacts. Uploaders deploy artifacts via smart contract and serve them to the downloaders. If the file is popular enough that the uploader themself can't serve all the downloaders, the uploader may enlist the help of farmers to distribute their content. The number and price of farmers enlisted is up to the uploader, allowing the uploader the flexibility to balance affordability and availability.

Downloaders

Downloaders are content users or consumers and the most common role in the DAN. Downloaders receive their artifacts from farmers and uploaders. Downloaders typically pay the farmers for their bandwidth in transmitting the artifact. If the artifact is encrypted, the downloader will need to get the encryption key from the uploader by telling them which farmer their artifact came from. Once the downloader has the artifact, they can then act as farmers and serve the artifact themselves for the bandwidth reward.

Farmers

The farmers are extremely important to the scalability of the DAN. Farmers deliver artifacts across the network to downloaders. Farmers are typically compensated for their storage by the uploaders and their bandwidth by the downloaders. On the launch of the network, Dispatch Labs will be offering free farming to help seed the DAN.

2.3. Dispatch blockchain

The Dispatch blockchain is the shared ledger that all nodes in the system have a copy of. This common state can be updated by sending transactions. Consensus is established with a (1) *Delegated Proof-of-Stake* algorithm, so the elected witnesses will write pending transactions into new blocks as they are appended to the end of the chain. Transactions can also include logic in the form of smart contracts. The Dispatch smart contracts are executed in the (2) *Dispatch Virtual Machine (DVM)*.

2.3.1. Delegated Proof-of-Stake (DPoS)

Using *Proof-of-Work (PoW)* as a consensus algorithm to solve the double spending problem was first defined in the Bitcoin white paper[11] and has since been implemented in some of the most popular blockchains. Yet despite its popularity, PoW is receiving a lot of criticism for its computational inefficiency. PoW mining for the Bitcoin blockchain alone consumes electricity at about the same rate as the entire country of Syria[12]. Mining costs Bitcoin network participants approximately $907,000,000 a year in electricity[12]. The costs are seen as an investment for miners hoping to turn a profit from their block reward.

The Dispatch blockchain is built with DPoS consensus for both business and moral reasons. By migrating to a DPoS mode of block validation, the costs associated with writing transactions to the blockchain fall dramatically and the transaction times can be brought down to nearly a single

[11] Nakamoto, Satoshi. “Bitcoin: A Peer-to-Peer Electronic Cash System.” Bitcoin.org, 2008.

[12] “Bitcoin Energy Consumption Index.” Digiconomist, 2017, digiconomist.net/bitcoin-energy-consumption.

second. High throughput and low costs make the usability of Dapps much more practical for businesses. In addition, Dispatch Labs wants to be an eco-friendly company built around sustainable technology. Digital scarcity and ecological sustainability shouldn't be mutually exclusive.

2.3.2. Dispatch Virtual Machine (DVM)

The Dispatch blockchain supports smart contracts that allow users to write and execute stateful programs using the blockchain's shared state. The DVM is the low-level language interpreter for executing smart contracts in the Dispatch system. The DVM is based on the existing Ethereum Virtual Machine, modified to handle artifact-specific operations. Artifacts are deployed to the DAN in specialized smart contracts. These DAN contracts use specialized opcodes for accessing and updating the artifact hash and updating the approved access list. Note that the smart contracts in the Dispatch blockchain are not artifact exclusive. Dapps that only use stateful data are still fully compatible with the DVM.

2.4. Dispatch Artifact Network (DAN)

The Dispatch infrastructure is based heavily on the storage, transmission, and manipulation of off-chain artifacts. The blockchain distributes information about the artifacts without sharing the artifacts themselves. The Dispatch Artifact Network (DAN) encompases the interactions between nodes involving off-chain artifact storage and transmission. Downloaders find the nearest farmer of an (1) *artifact* in their own personal (2) *Kademlia DHT*[13], and uploaders implement *Proof-of-Replication (PoRep)* security to stop farmer Sybil attacks[14].

2.4.1. Artifacts

Artifacts are the off-chain data referenced in the Dispatch blockchain. Storing data off-chain is critical to the long term scalability of the blockchain, as it allows the shared ledger to grow

[13] Maymounkov, Petar, and David Mazières. "Kademlia: A Peer-to-Peer Information System Based on the XOR Metric." Parallel & Distributed Operating Systems Group, MIT, 7 Mar. 2002.

[14] Protocol Labs. "Filecoin: A Decentralized Storage Network." 14 Aug. 2017.

linearly while the actual data in the system can grow exponentially. An artifact is some set of data that is written, read, and updated as a single unit. An artifact could be a document, movie file, .csv file, VR assets, software program, a random hexadecimal string, a private key, organized database data, another Merkle tree, or almost anything else that can be organized into a replicable data structure. Combined with the logic contained in the artifact's smart contract, the utility of that data becomes infinitely adaptable. Artifacts can be sharded and encrypted for extended security too. An artifact could exist as a band's album up for sale, or it could be a privileged access database.

Current off-chain initiatives like side chains become trivial to implement via Dispatch artifacts. An artifact implemented as a Merkle tree could be a public, private, or privileged side chain. Popular blockchain side chains implementations like Bitcoin and Litecoin's Lightning Network[15] and Ethereum's Raiden Network[16] require minimal configuration to build on Dispatch via artifacts, although a truly secure implementation will require the use of zk-SNARKs, and the secure generation of a *proving key* and *verification key*[17].

2.4.2. Kademlia DHT

The Kademlia Distributed Hash Table (DHT) is a hashtable data structure that sits on every node in the Dispatch network. The Kademlia DHT is each node's personal map to navigate the DAN. It starts with just a single connection and aggregates information from its neighbors to map out where nodes are in the DAN. The table maps user addresses to physical IP addresses for other nodes in the network in such a way that the search for any node in the network has an upper bound of $O(log(n))$, where n is the number of nodes in the network. In addition to the search for nodes, the Kademlia DHT can also watch and search for artifacts in the DAN with equal efficiency given that the artifact addresses are the same length as node addresses.

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[15] Poon, Joseph and Thaddeus Dryja. "The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments" 14 Jan. 2016.

[16] "What Is the Raiden Network?" Raiden Network, raiden.network/101.html.

[17] Gabizon, Ariel. "Explaining SNARKs Part I: Homomorphic Hidings." Zcash Blog, 28 Feb. 2017, z.cash/blog/snark-explain.html.

2.4.3. Proof-of-Replication (PoRep)

Proof-of-Replication (PoRep) exists to disincentivize Sybil attacks and gaming of the system by those who would otherwise pretend to be multiple farmers hosting the same file. The solution, outlined Filecoin's white paper[18], is to give a slightly differently encoded version of the artifact to each farmer, with an appropriately slow encoding process such that

$$T_{pass} < T_{decode}(Artifact) + T_{encode}(Artifact)$$

where T_{pass} is the time a farmer has to respond to a challenge. When each farmer has a different encoding of the shard, and the time to de-encode and re-encode a shard is greater than the time the farmer has to respond to a challenge, the farmers then have to store separate copies of the data for each farmer they are claiming to be.

2.5. Off-chain operations

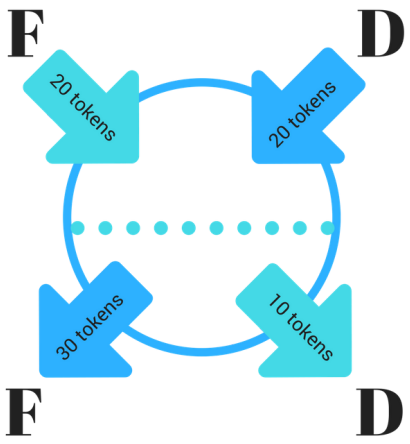
The scalability solutions implemented by Dispatch rely heavily on the ability to trustlessly move off-chain data between nodes in a cryptographically secure manner. This provides a challenge to the community when all nodes have to come to consensus on the result of an interaction between two nodes exchanging information they know nothing about. We can call these kinds of transactions between some parties but not all a *set exchange*. In a set exchange, a subset of the consensus group, which typically makes up less than the majority, is trusted by the entire group to report the accurate results of an exchange. In almost all set exchanges, some party has an incentive to lie about the results of the exchange, so Dispatch implements some novel cryptographic solutions to incentivise honesty between untrusted parties. Set exchanges between farmers and downloaders are transacted through the (1) *Make it Happen (MiH)* protocol. And set

[18] Protocol Labs. "Filecoin: A Decentralized Storage Network." 14 Aug. 2017.

exchanges between farmers and uploaders are transacted through the *Proof-of-Retrievability (PoR)* protocol.

2.5.1 Make it Happen (MiH) protocol

The set exchange consensus between farmers and downloaders is governed by the Make it Happen (MiH) protocol. Without every node storing every artifact, the system has to trust the nodes that are involved that the transfer actually took place. In situations where the farmer is charging the downloader for bandwidth in the file transfer, both parties have a reason to lie and either collect the downloader's payment without sending the file or get the file without paying the farmer.



MiH provides trust to the larger consensus group that neither party is dishonest, as dishonesty works against their own self interest in MiH.

In the MiH protocol both participants store Dispatch tokens in excess of the actual cost of the transfer in escrow, outside of the reach of either party for the extent of the exchange. How the artifact exchange happens or how many attempts it takes then becomes irrelevant. Once the tokens are locked, the rest of the network gets to say, "just make it happen."

Once the artifact exchange is complete, the payment is transferred to the farmer, and the escrow security deposit is returned to both parties. Because a timed release of the escrow would incentivise one of the parties to act dishonestly, tokens put in a MiH escrow are there until the transfer happens. This solution is fault-tolerant to farmer or downloader downtime and non-malicious failures, and downloaders will avoid going into transfers with farmers still in an exchange.

In the case that the farmer has lost their copy of the content, such as a corrupted hard drive, and has no way of retrieving it, the farmer can release the downloader's tokens and close the MiH exchange by burning their own deposit. The Farmer will lose their staked tokens, but also close their open MiH exchange, so other downloaders will start to offer exchanges for artifacts that they do have available.

2.5.2 Proof of Retrievability (PoR) protocol

The set exchange consensus between farmers and uploaders is governed by the Make it Happen (MiH) protocol. Farmers shouldn't be paid until they prove they have held the file for the duration of the storage contract. At the time of the contract initialization, a number of PoR challenges is agreed upon, and the full contract payment is put into escrow to be released upon completion of PoR challenges or to the farmer at the contract's expiration. The uploader can challenge the farmer any time during the contract duration. Each passed PoR challenge releases r coins to the farmer, and each failed PoR test releases r coins to the uploader, where:

$$r = \textit{Total storage payment / Number of PoR challenges}$$

The farmer then has an agreed upon number of blocks to respond to the test with a hash of a specific subset of the artifact and a based pseudo-random number. The pseudo-random number exists to so that the farmer can't just hold onto a part or a particular hash of the shard.

$$\textit{PoR Response} = H(\textit{Artifact[subset], Pseudorandom number})$$

If no response is provided, the farmer is presumed offline and the test reward is returned to the uploader. Otherwise, the uploader posts their own PoR response. If the hashes match, the farmer passing the test is given their coins. If the farmer and uploader's hash do not match, neither party can be trusted because both have an economic incentive to lie about what the true hash is. It then becomes the decision of the other owners of the artifact (farmers or downloaders) as to which party is telling the truth. In the case of a tie, the reward goes to the uploader.

3. Roadmap

As Dispatch is the architecture enabling a new ecosystem, it is the goal of the Dispatch team to create and support the development of that ecosystem. This support and development will focus in three main areas: Education, Community, and Financial Support. As such, our roadmap will address not just technical development but the additional ecosystem support needed for Dispatch to thrive.

To support education around the new ecosystem, Dispatch will create online and offline curriculums, certifications for businesses and developers, open source documentation and tools, as well as a direct communication line between the core team and interested parties. Dispatch will collate these materials, and bring in additional educational resources in order to create a Dispatch Online University, an educational resource for migrating business to blockchain and developing Dapps on the Dispatch Labs architecture.

To ensure the success of the network, and to integrate as positively as possible with existing and new businesses, the Dispatch team will work to build a robust community of developers, investors, thought leaders, blockchain enthusiasts, as well as members of the general population. By providing direct communication lines and methods, by actively engaging in social media and events, by presenting on our technology and capabilities, and by partnering with a variety of institutions, businesses, and individuals, Dispatch Labs will both create, and shephard the development of the community surrounding it. Additionally, Dispatch Labs will host an annual Dispatch Developers Conference.

The accelerate the transition of the business world to blockchain, Dispatch Labs will support, fund, and incubate external projects which will benefit the overall ecosystem, and provide value to end users and business clients. A scaling proportion of the tokens kept by Dispatch Labs will be devoted to the support and funding of these projects.

Additionally, as Dispatch Labs grows in size, technology, and personnel, extra resources will be made available by the company to benefit all of the above directives, including having staff assist with education, community, and third party projects as needed.

3.1. Roadmap

Q1 2018	Documentation for Dapp Development Support development of 3rd-party Dapps
Q2 2018	Genesis Block Launches Dispatch Token Listed on Exchange(s) Ongoing 3rd-party Dapps support
Q3 2018	Training Curriculum development: Developer Ongoing 3rd-party Dapps support
Q4 2018	Training Curriculum development: Business Education: Online training launch - Developer Ongoing 3rd-party Dapps support
Q1 2019	Education: Online training launch - Business Ongoing 3rd-party Dapps support
Q2 2019	Expanded online training - Developer and Business Ongoing 3rd-party Dapps support
Q3 2019	Launch Dispatch Labs University, including offline training First Dispatch Developers Conference Ongoing 3rd-party Dapps support
Q4 2019	Launch Dispatch certification program Ongoing 3rd-party Dapps support

3.2. Technical Development

Protocol developers and security auditors will be hired and paid in a combination of Dispatch tokens and more liquid currency. The genesis block's intended launch is in Q2 2018.Technical development will continue after the creation of the genesis block, with more developers onboarding to expand on the functionality of the Dispatch blockchain.

3.1.3. Platform projects

Even before the official launch of the Dispatch network, complementary projects are being built on top of the protocol. These Dapps will give immediate utility to the network and spark the creativity of entrepreneurs looking at the Dispatch protocol. Currently there are 4 independent Dapps being developed on the Dispatch protocol, including multiple projects from successful established businesses.

3.1.4. Extended system development

Our extended system development serves to improve the scalability, functionality, and usability of Dispatch and related blockchain systems. One of our highest priority extended development projects is the support for artifact streaming. Netflix video streaming now accounts for almost 37% of all bandwidth in North America[19]. The trend towards content streaming is clearly accelerating, and the DAN could become the new backbone of the streaming age by replacing one-to-one delivery systems with more efficient many-to-one peer to peer systems.[20] streaming quality could improve while reducing the costs of transmission. Primary development fields include artifact streaming to improve usability, efficient light client development for clear mobile support, and extended support for alternative off-chain data structures to further improve scalability and utility.

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[19]Fung, Brian. "Netflix Now Accounts for Almost 37 Percent of Our Internet Traffic." The Washington Post, WP Company, 28 May 2015.

[20] G. de Veciana and X. Yang. "Fairness, incentives and performance in peer-to-peer networks". In the Forty-first Annual Allerton Conference on Communication, Control and Computing, Monticello, IL, Oct. 2003.

4. The Company

Dispatch Labs is a registered California company based out of the Mission district of San Francisco. The team is a balanced blend of entrepreneurs, academics, business development, and technologists. Dispatch Labs is advised by some of the greatest minds in the blockchain ecosystem, and the strategic partnerships extended our credibility into both the blockchain and traditional business ecosystems.

4.1. Core team

Matt McGraw
Chief Executive Officer

Matt is an entrepreneur & CEO with expertise in quickly scaling successful businesses. After leading and shepherding a versatile range of tech companies, Matt's current focus is on technologies that disrupt hierarchies and disseminate control of secure information to data users, ranging from individuals to enterprise clients. His innate design thinking focus complements a belief that good corporate governance and culture make success possible.

Zane Witherspoon
Chief Technology Officer

Zane is an experienced blockchain architect, and distributed systems specialist. He is firmly entrenched as an expert in the blockchain world, sitting on the board of advisors for four California based blockchain companies, and an author in the space. His ceaseless pursuit to build something at the bleeding edge of what is currently possible makes Zane an invaluable leader on the Dispatch tech team

Patrik Wijkstrom

Chief Operating Officer

With over two decades of application development, process re-engineering, sales, marketing and team building, Patrik is an invaluable member of the Dispatch team. His peerless tech acumen is complemented by a deeper why, helping the people around him to grow, and a fundamental drive to leave the world a better place than he found it.

Raman Frey

VP of Business Development

Raman has operated in a variety of roles in San Francisco's fertile startup ecosystem, primarily in marketing, branding and strategy. A passion for building communities that foster lives of purpose, learning and adventure is reflected in everything he does. Raman brings his inspirational philosophy to Dispatch Labs, invigorated by the potential of blockchain technology to transform nearly every aspect of our lives for the better.

Diane Blattner Kresal

VP of Program Management

With a focus on building resilient, organized and adaptive systems within smaller companies, Diane brings over 20 years of operations and project management experience to Dispatch Labs. With a diversity of leadership roles from marketing to publishing to tech consulting, and an MBA from the University of San Francisco, her operational savvy is essential to the Dispatch and Bureau teams.

Ivan Goldensohn

Chief Marketing Officer

Ivan brings an international background and cross-industry marketing and business development experience. Ivan spent five years in video game marketing, launching multiple titles on several platforms and managing titles responsible for over 100m in regional revenue. Before moving to blockchain he spent several years doing business development related to CNS research in the pharmaceutical industry.

Ben Dutro

Chief Creative Officer

After 20 years in the business, Ben remains amazed that creative branding solutions are things that people will actually pay for. His versatility as an art director, copywriter, and creative thinker complement his inclusive approach to design, whether as a one man branding shop, or collaborating with Dispatch's impressive group of people much much smarter than him.

4.2. Advisors

Jake Vartanian

Advisor

Jake Vartanian is the founder of Cryptodex, a contributor to Blockchain News, and an advocate of decentralization since early 2011. He has worked with high profile startups including Bancor, TokenCard and SingularDTV, helping to design token models, telling the stories behind these projects, and building digital ecosystems. Jake's focus is on using emerging technologies to help communities become more aware of the immense value they hold.

Simone Giacomelli

Advisor

Simone has spent 4 years leading teams that provide next generation blockchain solutions for both the private and public sectors. Passionate and diligent about exploring relational economies and Decentralized Autonomous Organizations, he conducts research in novel cryptocurrency models, ICOs and incentive mechanisms that empower cooperation and value creation.

Tim Siwula

Advisor

Tim Siwula works on the Protocol team at ConsenSys with the initiative to design, build, and scale the future of blockchain interoperability, one protocol at a time. He is passionate about open source, developer tools, command line experiences, and API's. His industry experience ranges from banking, education, and security led organizations such as Lawrence Berkeley National Laboratory, Democratize Computing Lab, ADT, and Wells Fargo

Andrew Segal

Advisor

Andrew is a Professor of Computer Science at University of San Francisco and has been in several startups involving artificial intelligence, machine learning, neural networks and is currently working on block chaining systems. He has over 20 years experience in technology development for several markets and a PhD from University of Illinois-Urbana/Champaign.

Matt McKibbin

Advisor

In blockchain since 2013, Matt co-founded Ubitquity, the world's first blockchain-based title transfer company, and D10e the first and leading conference on decentralization. He advises Network Society Labs, Humaniq, Securrency, and Social Evolution, Loci, Trive, and Academy. In 2017 he founded DecentraNet, a leading blockchain firm. Matt has been featured in Bloomberg, Nasdaq, TechCrunch, CoinDesk, CoinTelegraph, and more.

Paul Lambert

Advisor

Paul Lambert is an applied cryptographer, inventor, entrepreneur and pioneer in Internet security. He has more than 30 years experience developing security protocols for large and small customers including the NSA, Oracle and the Wi-Fi Alliance. Passionate about using cryptography to improve the world, he has lead non-profit projects to create and distribute privacy systems. He consults and teaches cryptography at the University of San Francisco.

5. Conclusion

Blockchain technology has the potential to transform the world as we know it; yet its current functionality limits practical applications that are fundamental for mass adoption. The Dispatch network advances blockchain to its next generation, enhancing its capabilities by introducing the novel concept of off-chain Artifacts. This enables any Dapp developer to build an array of applications for the real world, across any industry, and unlock the true value of blockchain.

Dispatch is solving the two largest scalability issues in existing chains: transaction speed and chain size.

Dispatch has already attracted a mix of startups and established companies that are leveraging Dispatch to transform their businesses, kick-starting the adoption of Dispatch as the first truly scalable business-ready blockchain.