THE dCOMMERCE STACK

Disrupting commerce with a web3 ecosystem

BOSON PROTOCOL

Researched in collaboration with

Outlier Ventures

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"The world needs
a decentralized commerce
ecosystem where all participants
share in the value they create"

Justin Banon, CEO Boson Protocol

Foreword by Justin Banon, CEO and Co-founder, Boson Protocol

The journey that led me to found Boson Protocol has in many ways been an entirely natural progression for me. I started out doing a physics degree at Imperial College. Following that, I ended up at Priority Pass, where as MD, I scaled the business from $50m to more than $1bn revenue per annum. While I was there, I took a Master's in digital business - and that, combined with my first degree, made me obsessed with what I call the physics of business: network effects and platform business models.

Despite successfully blitzscaling the business, at the same time I was becoming increasingly disillusioned with my role as 'Chief Extractionary Officer', so to speak. My role was to extract more and more from buyers, sellers and even long-term employees and this did not sit easily with me. At this point I had become aware of seismic changes that were happening in tech emerging from developments in the decentralized web and the emergence of tokenized models, and I realised that the Web3 ecosystem would in fact give us the tools to rebuild commerce in the way it should be built.

I thought a lot about tokenized network effects and the latent power that was just waiting to be released, levelling the playing field and enabling an entirely new sharing economy. I saw it a bit like Meccano releasing a nuclear fusion kit, which fascinated me. I could see the potential for creating business models and indeed businesses that avoided the extraction imperative.

I wanted to build a system that would take the services provided by eCommerce monoliths and break them down into basic elements, which would create an entirely new decentralized commerce (dCommerce) network.

At Boson, we are making this theory a reality and building out a collectively maintained infrastructure made up of smaller, composable services for commerce: open, transparent, minimally extractive, and resistant to capture. This paper is our vision and framework to build this dCommerce ecosystem.

Justin Banon

CEO & Co-founder, Boson Protocol

BOSON
PROTOCOL

Foreword by Jamie Burke,
CEO and founder, Outlier Ventures

30 years since the advent of The Web, eCommerce has just become how we buy and sell stuff with over 18.1% of retail now happening online. Behind it are a handful of companies that have reached the economies of scale in both sales volume and buying power as both platforms and retailers, where because of their immense physical and IT infrastructure they can simply do it cheaper, and with more convenience, than anyone else. In fact, in Amazon's case, to the point of actually being able to do it at a loss and still be a $1 trillion dollar company by market capitalization. Many believe these platforms' scale, diversification and increasing power make them unassailable. But rapidly maturing new technologies like blockchains promise a new web paradigm some believe could transform ecommerce, unbundle or entirely replace the Amazons of this world. But is this even possible and if so, how?

The question of what to do with Big Tech

The Web's platform monopolies like Amazon in The West and Alibaba in Asia are often referred to fittingly as 'Big Tech'. The question of Big Tech and how it interacts with the wider economy, The State and its citizens, as both consumers and a workforce, as well as fundamental values like privacy and anti-trust, has now become one of the defining political questions of our time - not just here in the West but extending even into China with Alibaba and its finance arm Alipay. These platform monopolies are the defining characteristic of the last 30 years of the Web with increasing consolidation in a growing number of categories and markets.

However, the advent of new technologies like Bitcoin and subsequent blockchains promises a new web paradigm, often referred to as Web3, which prizes decentralization and the removal of intermediaries, such as platforms monopolies - or at least makes it possible to transform them, perhaps progressively unbundle or even entirely overturn them. We believe this is to a degree inevitable, and by replacing the e with a d (for the process and characteristic of decentralization) so significant it deserves its own name: dCommerce.

Blockchain and the idea of dCommerce

We began to think of the idea of a form of online commerce different from, distinct from and competing with that of an Amazon when we founded Outlier Ventures in 2013 and first referenced the term 'dCommerce' back in Feb 2016

when we began to ponder on the implications of blockchain, playing with a POC (proof of concept) called BuyCo.

The idea was that you could remove and decentralize specific functions of an ecommerce platform through smart contracts that would aggregate and move value around automatically on a blockchain as a distributed ledger. This was - and still is - an overly simplistic way of thinking about the complexity of a holistic ecommerce platform like Amazon and its reasons for success but offers a glimpse of a possible direction of travel to take on the trillion dollar opportunity: in other words, beating Amazon.

After five years that reality has still not come close to pass but much of the technical infrastructure, or stack, that could make it possible (the advent of protocols like Ethereum, for example) is here and sufficiently mature to be ready for prime time. Equally, the political understanding and climate, at least here in Europe, of this emergent stack as an antidote is growing in awareness alongside a backdrop of media coverage of breaking up Big Tech and attacking the extractive business model of Surveillance Capitalism: that is, the exploitation of users and their privacy in the maximisation of data extraction to sell more products and services through ecommerce.

But as the book Surveillance Capitalism lays out - and we will later explore - this is not as easy as it seems with increasing levels of state and legislative capture by Big Tech which could prove to be its last and ultimately most defensible moat and the hardest thing to simply replace with code.

The dCommerce Stack: an invite to an ecosystem

Whilst still nascent, the most promising thing to emerge from blockchain, and Ethereum in particular, is something called DeFi (Decentralized Finance). Which are a series of independent but complimentary highly specialized open source protocols built on top of the Ethereum blockchain. Together they form a highly composable stack that allows for a range of financial applications to be built and executed on top. This includes the ability to create a new form of programmatic digital asset such as a currency, or representation of a real world or entirely synthetic asset and then carry out increasingly complex forms of borrowing, lending, speculation or arbitrage. This has been referred to as 'money Lego' and has both sucked in and created entirely new forms of billions of dollars worth of value into a proto-capital-market outside the jurisdiction of any one country, and native to the internet.

There is no one company or platform that dominates it but rather an ecosystem of open technologies which compound one another into something unstoppable. This forms the basis of, and inspiration for, dCommerce which will see its own

composable stack of technologies emerge to unbundle at least some parts of ecommerce platforms. The full extent is still to be seen, but we hypothesize here.

Boson Protocol is the cornerstone of a dCommerce stack, in the same way stablecoins were to DeFi, their novel exchange mechanism allows for the first time digital-to-physical exchange to be possible, at scale, and is why we become their first investor back in 2019. But this is just the beginning. Together with them, we hope to enable a whole ecosystem to not only unbundle ecommerce but make entirely new kinds of commerce in the Metaverse possible where the physical and digital worlds become indistinguishable and one and the same.

This paper is Boson's vision for how we collectively make this happen and is an invite to a universe of academics, innovators, entrepreneurs and investors to mobilise and make this happen without the need for central coordination.

Jamie Burke

CEO & Founder, Outlier Ventures

Introduction

With the emergence of Web3[1], we were given the tools to transfer value over networks much like we transferred information. This quickly led to fledgling digital economies, where one type of tokenized value was transparently exchanged for another without the need for intermediaries; the purchase of physical goods and services still required that we revert to those familiar, yet extractive legacy commerce platforms. Before long, the first-generation decentralized commerce platforms proved the technical feasibility of displacing their centralized counterparts - but at a price. They retained the cost and friction of human arbitrators, and thus failed to address the needs of consumers.

Recently, with the emergence of more evolved Web3 tools, another concept has surfaced, which begs the following questions:

Instead of building just another platform, what if we unbundled the services provided by eCommerce, and broke them down into basic elements? What if we rebuilt those elements as Web3 artefacts, individually atomic fragments of functionality, and collectively a composable, decentralized ecosystem for commerce? What if this ecosystem became, in fact, public infrastructure for commerce: open, transparent, minimally extractive, and resistant to capture? Most importantly, what will it take to build it?

This is the concept and ethos of dCommerce. In order to build it well, and avoid the pitfalls of the past, we will have to rely on collective intelligence. Great disruption will require great effort, and also a great community of experts, builders, and users. Because of the potential societal implications and consequences of our design choices, we must be careful not to simply 'move fast and break things' just because we can; whilst pragmatic, we must be considered and realistic in the knowledge that, whilst the outcome may yield a net benefit, it will cause huge disruption to the way whole economies function.

[1]"Web2 vs Web3 | ethereum.org." https://ethereum.org/en/developers/docs/web2-vs-web3/. Accessed 17 Mar. 2021.

Introduction

Commitment and Exchange: Commitment NFTs

In its most basic form, a commerce transaction is no more than an atomic exchange of value for a good or a service. While decentralized technologies have, for a while now, facilitated atomic exchange of digital value alone, using them for day to day commerce was difficult because tokenizing physical objects and representing them on-chain is challenging. It requires more trust, which increases latency and cost, and reduces transparency. In short, decentralized yet atomic purchases of physical goods were impractical, if not impossible.

If we, however, provide tokenized commitments from the buyer to the seller, instead of goods themselves, then atomicity in dCommerce becomes more achievable: instead of tokenizing an object, we are now tokenizing a promise to deliver that object, and the fulfilment of that promise completes the atomic transaction between the seller and the buyer.

These commitments can be thought of as futures contracts for goods or services (henceforth Things), programmed within commitment tokens. Having custody of a commitment token grants the holder the right to redeem the token for a particular thing in an automated, reliable and secure way, as well as the right to transfer the token from a crypto wallet just like any other. Boson Protocol for the first time makes this possible, automating the creation, payment, and execution of tokenized commitments (promises) by using non-fungible tokens (NFTs[2]) encoded with game theory. Representing the commitment to exchange Things as NFTs, which are programmable, interoperable and composable[3], is very different from simply rebuilding an ecommerce platform on a blockchain.

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[2] "Boson Protocol." https://bosonprotocol.io/. Accessed 17 Mar. 2021.
[3] "Composability – Wikipedia." https://en.wikipedia.org/wiki/Composability. Accessed 17 Mar. 2021.

Things, money and data:
An open tokenized economy
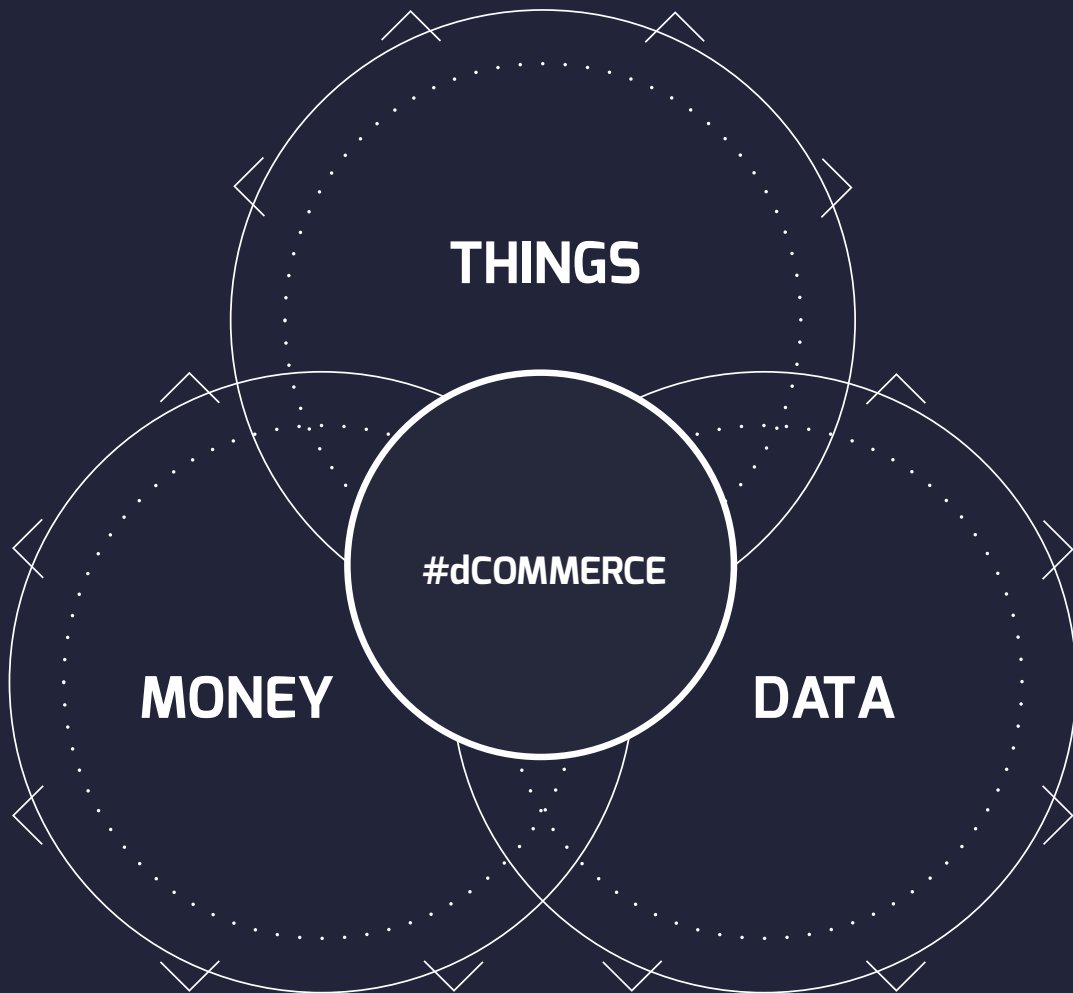

THINGS

#dCOMMERCE

MONEY

DATA

Figure 1

Boson Protocol's vision is to enable a decentralized commerce ecosystem by funding and enabling the development of a stack of specialized applications to disrupt, demonopolize and democratize commerce.

Introduction

Money and Things: Thing Tokens

Counterintuitively, and unbeknownst to their users and creators, dCommerce tools have existed in Decentralized Finance (DeFi)[4] for some time. Much like Ocean Protocol repurposed[5] the existing DeFi infrastructure to serve the data economy, dCommerce can do the same to convert the siloed and stagnant commerce of today into an open tokenized Thing economy of tomorrow.

Here's how this works: each type of Boson Protocol commitment NFT can be purchased with a specific Thing Token. Holding a Thing Token implies the right[6] to convert it for a non-fungible commitment token (which is like a promissory note[7] to receive the goods); holding a Thing Token also gives you the right to transfer it to someone else.

Because Thing Tokens are fungible tokens (e.g. ERC20[8]), they behave like both goods and financial instruments, and can thus be transferred and traded using standard crypto infrastructure such as wallets and exchanges. Thing Tokens plug into DeFi infrastructure to enable liquid digital markets for any Thing. This includes using decentralized exchanges (DEXs) like Balancer and Uniswap to enable price discovery and yield optimization of existing products, and crowdfunding of future products via Initial Thing Offerings (ITOs). Thing Tokens are fully interoperable and composable within the DeFi ecosystem which enables out-of-the-gate liquid marketplaces of physical assets by enabling real-time discoverability, usability and payment.

Suddenly, with the introduction of ERC20 Thing Tokens as a proxy for commitment NFTs, dCommerce acquires not only the liquidity and tools previously available only to financial markets, but also basic primitive implementations such as wallets, payments, insurance, provenance, price discovery, co-ops, and more.

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[4] "Web2 vs Web3 | ethereum.org." https://ethereum.org/en/developers/docs/web2-vs-web3/. Accessed 17 Mar. 2021.
[5] "Ocean Datatokens: From Money Legos to Data … - Ocean Protocol." 8 Sept. 2020, https://blog.oceanprotocol.com/ocean-datatokens-from-money-legos-to-data-legos-4f867cec1837. Accessed 6 Mar. 2021.
[6] "Property rights (economics) - Wikipedia." https://en.wikipedia.org/wiki/Property_rights_(economics). Accessed 17 Mar. 2021.
[7] "Promissory note - Wikipedia." https://en.wikipedia.org/wiki/Promissory_note. Accessed 17 Mar. 2021.
[8] "What Is ERC-20 and What Does It Mean for Ethereum? - Investopedia." 6 Sept. 2020, https://www.investopedia.com/news/what-erc20-and-what-does-it-mean-ethereum/. Accessed 17 Mar. 2021.

Introduction

Data: dCommerce Graph

Any activity generates data, and commerce generates particularly valuable data. Data is also the lifeblood of DeFi, enabling quality and risk ratings for dCommerce actors, goods, and services, and thus facilitating key elements such as insurance, credit, and more.

Because dCommerce conflates things, money and data, and manages them using open, decentralized databases, we will be in a position to pool a valuable graph of consumer preference data. Instead of capturing users' data and separating them from the value it creates, dCommerce incentivizes voluntary data sharing by providing users with an equitable distribution of the proceeds from monetizing their data. In particular, Boson Protocol leverages Ocean Protocol to develop a planetary-level Web3 data marketplace for commerce in which data buyers may purchase personal, product preference, pricing and ratings data to predict consumer buying behaviour, inform product development or develop market insights. Users can decide whether they want to share the data that their activities generate, and whether they want to earn money for sharing it.

We believe that money and Things, commitments and exchange, and data together form the kernel of the dCommerce stack, and, along with analogues to other commerce primitives, comprise a set of decentralized and composable tools to disrupt, demonopolize and democratize legacy commerce.

But, what are those primitives, and how do we build their decentralized counterparts? How ready is dCommerce for prime time? Is it possible to repurpose some of existing Web3 tools and use them for dCommerce? Can the exchange mechanism support all eventualities? What are the hard problems, and how do we solve them?

dCommerce Architecture

When thinking about the way societies and civilizations have managed the exchange of goods and services, from ancient times until the present day, many commerce primitives seem to have survived the test of time. Depending on the exact market vertical, a well-developed dCommerce stack will need to facilitate some or all of these primitives.

Some of these primitives already exist in Web3, and some are being created. The benefit of Web3-native solutions is that, by virtue of composability, they behave as Legos, i.e. they can seamlessly connect with each other, and thus support the overarching goal of dCommerce: frictionless, transparent and fair exchange of goods and services, where actors benefit if the ecosystem benefits, and behave in its long-term interest.

In other words, dCommerce is not just replacing legacy platforms with decentralized equivalents; instead, it creates structures of improved and fluid capability that, through swarms of highly specialised but composable protocols, gather, disperse, and assume new forms quickly and easily.

In the endeavour to shape different Legos into a coherent dCommerce whole, we must be mindful that not all components will be equally reliable, or important. In other words, when re-designating existing Web3 components and developing new ones, some will be foundational, and others won't, and some legacy primitives could, in time, disappear. dCommerce primitives such as stablecoins, Thing tokens, and commitment NFTs, which are at the very heart of the ecosystem, will have to withstand the tests of time, markets, and less than benevolent actors. Much like the foundations of a building, if one of those primitives fails, then everything built on top of it will suffer damage. While collapses are to be expected - as with any nascent technology - they will be limited and won't deter ecosystem growth. As demonstrated by DeFi, decentralized systems are antifragile[9], both in terms of technology and utility.

dCommerce will initially serve B2C markets, due to the higher levels of complexity, risk, and compliance in B2B markets, as well as the more limited number of actors.

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[9] "Antifragile - Wikipedia." https://en.wikipedia.org/wiki/Antifragile. Accessed 18 Mar. 2021.

"dCommerce is not just replacing legacy platforms with decentralized equivalents; instead, it creates structures of improved and fluid capability that, through swarms of highly specialised but composable protocols, gather, disperse, and assume new forms quickly and easily."

dCommerce primitives

Payment

Historically, sellers and buyers have relied on assets that simultaneously function as means of exchange and unit of account (e.g. money), to facilitate the payment as the first part of the exchange. Those assets were fungible, stable relative to the thing being purchased (e.g. if a sheep was worth 10 cowry shells today, then it would most likely be worth the same tomorrow), and buyers and sellers were able to interpret denominations and amounts as something that is meaningful to them.

Following this logic, we expect dCommerce payments to rely primarily on stablecoins, which do exhibit characteristics of money, to exchange them for Thing Tokens. More importantly, stablecoins are, as the name says, more stable than other cryptoassets, thus both reducing volatility for buyers and sellers, as well as giving more meaning to user balances. They are a key tool to attract Web2 users into the budding dCommerce economy.

Depending on their level of comfort, users could choose another denomination that is right for them, and use one of many DeFi protocols to facilitate the conversion and payment. Any buyer asset could be used as input for payment, and converted into whatever the seller is demanding.

It should be noted that payments in dCommerce require a slightly more complex process than in legacy commerce. Instead of using money as the sole and direct means of payment to the seller, buyers in dCommerce will use any asset to buy Thing Tokens, and exchange Thing Tokens for commitment NFTs. This key difference is necessary to give dCommerce the velocity and liquidity of financial markets, and it should be hidden from users that don't want it. In other words, a smart, layered approach to user experience is key to reducing perceived complexity, which is key to adoption.

Another element in attracting Web2 actors, and their custom, will be smooth integration with fiat on/off-ramps as well as more complex systems that facilitate buyer payments and seller payouts between crypto and fiat worlds.

Examples:
DAI, USDC, USDT, BUSD, Paxos, Moneyfold. Metamask, TrustWallet, MyCrypto, Argent, InstaDapp, Zerion, Ledger, WalletConnect, Dharma, LeadWallet, Fuse, Amasa.

Coinbase, Kraken, Binance, Coinpass, Eidoo, Orion, Coinburp, BitHolla. Circle, Wyre. Uphold, Paxos, Ramp, GoCoin. CoinPayments, SatoshiPay, AlchemyPay, Dharma.

dCommerce primitives

Commitment

Historically, in receiving a payment, the seller made a commitment to the buyer to deliver the goods or services. If those goods weren't delivered at the point of sale, sellers would document their commitments to buyers to complete the exchange at a later time.

In dCommerce, these commitments are represented by Commitment NFTs. The NFT is minted by the seller, and transferred to the buyer when the buyer commits the payment amount, and both buyer and seller commit deposits to the protocol escrow. The buyer can then redeem the Commitment NFT for goods and services paid, or refund it. Commitment NFTs also introduce the concept of Stateful NFTs: they represent promises from sellers to buyers, and reflect the fulfilment of that promise in every stage of the process; in other words, they are state trackers for Boson's exchange mechanism.

Commitments generate data, which users can choose to reveal to others and monetise. Examining a Commitment NFT reveals the history and state of a particular exchange; analysing data from a large number of exchanges in aggregate reveals the quality of sellers and buyers, goods and services and their reputations.

Commitment NFTs are also liquid (although to a lower degree than Thing Tokens), and could be sold on secondary markets, or just transferred to someone else as people speculate on the likelihood of timeliness or quality of fulfilment, allowing for market based reputation systems, insurance and staking as vouching for new participants that enter the system.

Examples:
Boson Protocol

dCommerce primitives

Exchange Mechanism

In legacy commerce, more often than not, and almost always when not co-located, buyers and sellers will pay intermediaries (or arbitrators) to manage risk and trust. Those intermediaries will perform the exchange, and provide counterparties with appropriate guarantees.

In dCommerce, this role is taken on by Boson Protocol's core exchange mechanism. Commitment NFTs are used to govern the exchange mechanism, which is a type of sequential game[10] in which buyer and seller commit deposits up-front. Game rules and the final deposit transfer scheme are designed in such a way that they coordinate transactions and incentivize parties to behave fairly, therefore reducing the need for intermediaries.

The exchange mechanism can also be interpreted as a generic method of managing promises between sellers and buyers. While commitment NFTs represent promises and track the state of a particular exchange, the exchange mechanism is a way of incentivizing parties to a transaction to fulfil these promises in the most efficient way. It can be a promise to deliver goods or services; these goods or services can be digital or physical; the promise can be fulfilled at the point of sale, or elsewhere, within the time specified at the moment of sale; the promise can be fulfilled by the seller, or someone on their behalf (e.g. prepaid Starbucks coffee vouchers redeemed in any branch worldwide; a parcel delivered to the buyer by a courier, on behalf of the seller), and the beneficiary can be the buyer, or anyone else (e.g. the buyer orders a gift for a loved one, fulfilled by a courier, on behalf of the seller).

The domain and effectiveness of this exchange mechanism is not unlimited. While it does increase flexibility and reduce the need for trust and arbitration, it will still require escalation in some circumstances.

Let's expand on this: Following the principle of evolving complex systems with guard rails, the system starts with arbitration to ensure the system behaves as intended; however, arbitration doesn't scale. The system will bounce around within a specified zone; when the system hits a boundary, arbitration will be used

to push it back. Algorithmic triage will then be added recursively to automate this intervention in future, resulting in a progressive increase in autonomy and decrease in arbitration. In other words, developing Boson Protocol's sequential game further, and implementing smart, transparent, and autonomous methods for arbitration will be key to reducing the need for exceptions and human intervention.
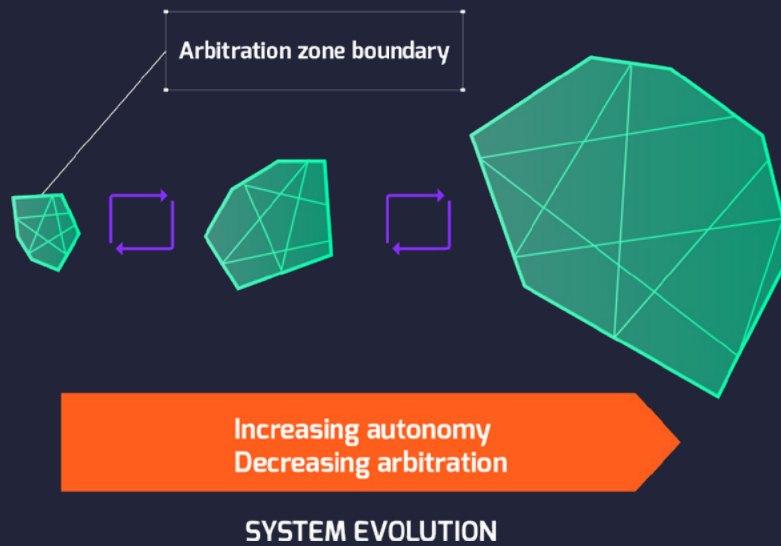

Figure 2

We expect multiple interactions and versions of this exchange mechanism to emerge, to address the needs of exchange of different goods and services and in different environments

Finally, we should acknowledge that the sequential game introduces complexity formerly unknown to most participants in commerce. It follows that, again, smooth user experience and user education will be key to wider adoption.

Examples:
Boson Protocol

[10] "Sequential game - Wikipedia." https://en.wikipedia.org/wiki/Sequential_game. Accessed 18 Mar. 2021.

dCommerce primitives

Identity

Traditionally, sellers and buyers want to establish trust between each other, and for that they use credentials that contain names, addresses, and other sensitive information. The sliding scale goes from the full, legal identity of a person or an organisation, to only delivery details, or even less than that.

Although Web3 enables anonymous commerce with assurances (i.e. transactions where actors don't know the identities of their counterparties, but they can trust the system without reliance on intermediaries), some cases will require more than that. In dCommerce, limited identities will initially be inherited from the front-facing elements of the stack and kept off-chain (e.g. custodians, marketplaces and on-ramps will perform KYC and keep the information off-chain). Later, self-sovereign identity[11] will allow actors control over the information and data that their activities generate. This type of identity replaces plastic and paper credentials with digital proofs that are minimally exposed to relevant counterparties; for example, instead of sending a copy of a document, its owner will selectively disclose its attributes using cryptographic proofs. This exchange is facilitated by two standards:

Decentralised Identifiers[12] (DID), globally unique identifiers, decoupled from centralized registries, and controlled by entities that they belong to;

Verifiable Credentials[13] (VC), a set of one or more claims about an entity (including a reference to a Decentralised Identifier).

For example, a person would have a DID, and their age would be proven with a VC issued by their government, referencing their DID. Both standards often use blockchain, both to prove issuance and ownership, and to make tampering evident.

It goes without saying that various dCommerce components should aspire to avoid storing or processing personal information; instead of doing that, they should hand over the handling of personal data to 3rd party protocols and

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[11] "Self-sovereign identity - Wikipedia." https://en.wikipedia.org/wiki/Self-sovereign_identity. Accessed 19 Mar. 2021.

[12] "Decentralized Identifiers (DIDs) v1.0 - World ...." 18 Mar. 2021, https://www.w3.org/TR/did-core/. Accessed 13 Apr. 2021.

[13] "Verifiable Credentials Use Cases - World Wide Web Consortium." https://www.w3.org/TR/vc-use-cases/. Accessed 13 Apr. 2021.

services only when relevant (for example, for fulfilment by courier companies).

Identity requirements increase for B2B and public sector use cases, as organisations care more about their counterparties' identities, and are subject to regulatory oversight often requiring the use of legal identities. This increases further for use cases related to traceability and dangerous or restricted goods.

Examples
Civic, Sovrin, Evernym, Crucible, Serto, Blockpass, Ceramic, Element, 3box.

dCommerce primitives

Legal Agreement

Traditionally, and depending on their perception of risk, sellers and buyers sometimes feel more comfortable when they articulate the mechanics of an exchange in a binding legal contract.

In dCommerce, our focus will be on smart contracts. There can be many misconceptions about them, but special attention must be paid to the relationship between smart contracts and legal contracts. Smart contracts usually cannot act as a technical representation of a legal contract[14]; they are more rigid than legal contracts[15], limiting their ability to express some elements of traditional contracts in decentralised application code[16]. There are different approaches to solving this challenge: a legal contract can be linked to a smart contract or a smart contract can sometimes be used on its own. Either way, the validity of such contracts will be looked at from governing jurisdictions' point of view. The advantage of linking a written (traditional) legal contract with a smart contract is the ability to outline how a problem in the code (like a bug) could be rectified[17]. This link could be made only as a written reference to the smart contract in the legal contracts, or could be done fully in code.

Several projects facilitate the relationship between code and law. OpenLaw[18] provides resources for developers to build legal contracts with their open-source language and integration APIs. A more recent project, Lexon[19] endeavours to create a human-readable programming language used to create blockchain smart contracts that are legal agreements and self-executable code at the same time. Combining controlled natural language and domain-specific language, Lexon allows the programmer, the lawyer, to use English words to draft the contract that would automatically convert into code[20].

Although regulators' response to new ways of writing legal contracts is increasingly positive, an international legal framework specifically designed for blockchain technologies and smart contracts does not exist; in its absence, existing legislation will be applied. And yet, and especially in the US, we have

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[14] https://policyreview.info/open-abstracts/smart-contracts

[15] "Blockchain and the law: The rule of code, De Filippi, P., & Wright, A., Harvard University Press." 2018.

[16] "Smart contracts and the cost of inflexibility, Sklaroff M., J., University of Pennsylvania Law Review" https://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=9605&context=penn_law_review. Accessed 14 Apr. 2021

[17] "Languages for Smart and Computable Contracts, Clack D., Christopher" https://arxiv.org/abs/2104.03764, Accessed 12 Apr. 2021.

[18] "OpenLaw." https://www.openlaw.io/. Accessed 14 Apr. 2021.

[19] "Lexon Digital Contracts" https://www.amazon.com/Lexon-Digital-Contracts-Henning-Diedrich/dp/169774768X. Accessed 2 Apr. 2021.

[20]

seen important steps made in this direction[21].

While this area is still in its nascency and will require the legal world to accept Web3 as a domain for negotiation and provisioning of legal agreements, conflating legal artifacts and their on-chain execution is necessary to fully streamline higher-risk dCommerce exchanges.

Examples:
Open Law, Lexon

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[21] "Evaluating US smart contract legislation - International Bar Association." 20 Apr. 2019, https://www.ibanet.org/Document/ Default.aspx?DocumentUid=C8D2EBA4-57D1-4F01-8AA5-24C9CFF2B447. Accessed 14 Apr. 202

dCommerce primitives

Organisation

In legacy commerce, buyers and sellers often want to limit their personal liability[22] by trading through companies and other types of legal entities, on a permanent or ad hoc basis.

In dCommerce, corporations will transition into Decentralized Autonomous Organisations[23] (DAOs), that will be less hierarchical, governed by the community, but also programmable and automated (maybe even autonomous) to a certain degree. DAOs are at the heart of Web3 and can be defined as "a blockchain-based system that enables people to coordinate and self-govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (i.e. independent from central control)"[24].

Nevertheless, the question often arises if DAOs should be legal entities. Similarly to linking written legal contracts to code, the same logic could apply to DAOs. Some operating DAOs are linked to a legal entity, the choice of which depends on the use cases and the jurisdictions they operate in. The limited liability for-profit wrappers known as LAOs[25] are a great example: while still retaining fair and transparent distribution (to a certain extent) of ownership, value and control, they offer a compliant way to operate in the US. In general, due to it's usually nonhierarchical, open structures, legal entities like cooperatives or foundations could be a good choice for DAOs, because they reflect community ownership and mission oriented nature.

Lately, new laws[26] are being drafted to support the realities the DAOs present and to foster their development. The topic is under consideration, especially at the legislative level and some laws have already been passed in jurisdictions like Wyoming, Vermont, Malta and others.

At the same time, many DAOs operate in a completely decentralized manner from their inception on or they attempt to reach it over time[27]. Linking a DAO

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22 "Limited liability - Wikipedia." https://en.wikipedia.org/wiki/Limited_liability. Accessed 18 Mar. 2021.
23 "Decentralised autonomous organisation | Internet Policy Review." 17 Nov. 2020, https://policyreview.info/open-abstracts/decentralised-autonomous-organisation. Accessed 14 Apr. 2021.
24 "Decentralized autonomous organizations - Internet Policy Review." 'https://policyreview.info/open-abstracts/decentralised-autonomous-organisation. Accessed 14 Apr. 2021.
25 "The LAO: A For-Profit, Limited Liability Autonomous Organization ...." 3 Sept. 2019. https://medium.com/openlawofficial/the-lao-a-for-profit-limited-liability-autonomous-organization-9eae89c9669c. Accessed 21 Mar. 2021.
26 "Wyoming senate bill 38." https://legiscan.com/WY/bill/SF0038/2021. Accessed 2 Apr. 2021.
27 "What will Maker governance look like after complete decentralization | Makerdao" https://blog.makerdao.com/what-will-maker-governance-look-like-after-complete-decentralization/. Accessed 14. Apr. 2021.

to a legal entity could be incompatible with its autonomous nature[28], because some actors need to be identified as responsible for the action of an entity. Some initiatives are raising the question of whether DAOs should be recognised as legal entities[29].

Except for LAO, most software projects supporting the development of DAOs are building user friendly software that supports a participatory form of DAO governance, but do not offer solutions to link them to a legal entity.

Examples:
LAO, Aragon, Colony, DAOStack

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[28] "Decentralized autonomous organizations - Internet Policy Review." 'https://policyreview.info/open-abstracts/decentralised-autonomous-organisation. Accessed 14 Apr. 2021.
[29] "The DAO Model Law | COALA GLOBAL" https://medium.com/coala/the-dao-model-law-68e5360971ea. Accessed 14 Apr. 2021.

dCommerce primitives

Dispute

A dispute will usually occur when seller and buyer disagree on the quality of goods and services, or their price, after fulfilment. A dispute can result in return of an item and/or a refund, or in nothing at all. Prudent buyers and sellers know the cost of disputes, and aim to reduce their likelihood. When they do occur, disputes often require arbitration.

Although Boson Protocol's exchange mechanism aims to reduce the likelihood of disputes, and the consequent need for arbitration, tail cases, especially those involving valuable goods, may still require mediation. Disputes in dCommerce will take a number of forms: initially, from human arbitration-by-exception, to existing Web3 dispute solutions such as decentralized courts, to, eventually, fully autonomous machine arbitration. This will require increasing acceptance of executable code as law, as well as smart contracts generally, and in commercial law, which we already see in jurisdictions like Delaware[30].

Legacy commerce intermediaries currently bundle disputes and returns; dCommerce will unbundle that process into assessment of seller quality and risk, claims assessment and handling, and, finally, insurance cover for refunds. In other words, in dCommerce, the buyer could choose whether to purchase at risk, or to insure the transaction. If the seller has a poor track record, the buyer's risk is greater, and consequently the insurance is more expensive.

Examples:
Kleros, Aragon Court

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[30] "Evaluating US smart contract legislation - International Bar Association." 20 Apr. 2019, https://www.ibanet.org/Document/Default.aspx?DocumentUid=C8D2EBA4-57D1-4F01-8AA5-24C9CFF2B447. Accessed 21 Mar. 2021.

dCommerce primitives

Price Discovery

Buyers want to get the best price for the goods that they are purchasing. Sometimes they can negotiate directly with the seller; at other times, they will use marketplaces or more specialized mechanisms.

Fortunately for dCommerce, DeFi is brimming with tools that facilitate price discovery, from AMMs[31] to bonding curve liquidity pools[32] to future buyer DAOs that aggregate purchasing power and negotiate better prices. With time, Autonomous Economic Agents[33] (i.e. robo-advisors for dCommerce) will further improve user experience and reduce the burden of decision-making on buyers, eventually converging into a point where all commerce is managed solely by autonomous sovereign entities that understand and represent their masters' best interests.

Examples:
Uniswap, Kyber, Balancer, Curve. Coinbase, Kraken, Binance. dYdX, 1inch, DEX.ag, 0x, AirSwap. YOP Finance

[31] "What Is an Automated Market Maker (AMM)? | Gemini." https://www.gemini.com/cryptopedia/amm-what-are-automated-market-makers. Accessed 18 Mar. 2021.
[32] "Bonding Curve | CoinMarketCap." https://coinmarketcap.com/alexandria/glossary/bonding-curve. Accessed 18 Mar. 2021.
[33] "Introducing Autonomous Economic Agents (AEAs) | by Fetch.ai ...." 9 Nov. 2019, https://medium.com/fetch-ai/introducing-autonomous-economic-agents-aeas-a6290c2092ac. Accessed 18 Mar. 2021.

dCommerce primitives

Fulfilment

Currently, when the goods are not handed over at the point of sale, buyers will arrange pick up from the seller (or their warehouse), or sellers will arrange delivery to the buyers.

In dCommerce, this is the moment when digital becomes physical, and Boson's commitment NFTs are redeemed for physical goods or services to complete the exchange. To facilitate this conversion, Boson Protocol is developing a set of open source modules that take information from the seller or marketplace (the type of goods, their location, delivery location, delivery mode, etc.), and use it to arrange fulfilment, either through buyer collection, courier delivery, or a specialist shipping company (e.g. for high-value artwork).

These modules will receive information from the exchange mechanism, and feed it into the APIs of courier and fulfilment companies, who then organise delivery and confirm receipt. On receipt, the module signals to the exchange mechanism that the goods have been received by the buyer, therefore bringing the process closer to completion. Boson Protocol's core exchange mechanism enables end-to-end trust-minimized exchange, and applies the concept of a trust grayscale: the buyer can sign the receipt themselves, or delegate signing to a trusted agent, such as a courier who signs on their behalf (which, implicitly, requires the buyer to trust the courier's API). The matter is further complicated by the practical and legal difference between confirmation of delivery (e.g. courier leaving the parcel by the front door), and confirmation of receipt (e.g. courier delivers the parcel to the recipient and confirms their identity).

Looking beyond that, and farther into the future, we see individual items being paired with NFTs, as a guarantee of uniqueness, but also as a way of managing product state and provenance, from factories, to warehouses and couriers, and later from one buyer to another. The entire process could be autonomized using one of a host of Industry 4.0 solutions.

The complexity of fulfilment processes increases in B2B environments, where they depend on actors such as freight forwarders, and complex legal structures such as incoterms[34].

Examples:
DHL, Fedex, UPS, DPD, DX Freight

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[34] "Incoterms – Wikipedia." https://en.wikipedia.org/wiki/Incoterms. Accessed 18 Mar. 2021.

dCommerce primitives

Insurance

Sometimes, and especially for higher-value exchanges, buyers and sellers will seek out insurers to reduce the risk of the transaction, or even that of the market.

Insurance, in general, applies to any source of risk in dCommerce, and is subject to market forces. This means that various types of risk, whether they are related to fulfilment, returns, or refunds after the fact, will be addressed by the decentralized insurance market. In other words, for the insurers, risk is a source of revenue, and they will seek it out to reduce it.

The use of data oracles feeding DeFi insurance algorithms allows for the creation of enhanced insurance, return and refund services unbundled and recomposable from the existing eCommerce stack. Although most DeFi insurers currently insure contracts or entire protocols, dCommerce insurance schemes will offer to secure individual transactions (or even segments of a transaction such as despatch, returns, or refund after the fact), as well as to pay out for refunds after the exchange has been completed.

Examples:
Nexus Mutual, Bridge Mutual, Etherisc, Cover Protocol

dCommerce primitives

Marketing

Sellers increase demand by marketing and advertising their goods, which then helps buyers refine supply and make purchasing decisions.

In dCommerce, Web3 advertising schemes already exist, and rely on Web2 channels such as the Brave browser. In the near future, and with the benefits of composability, dCommerce will develop native and more autonomous methods of acquiring and retaining users through Web3-first instruments like NFTs that can be, for example, used as a form of reward or on-chain referral mechanism.

However, the challenge is complex: we need Web3 tools that can both generate buyer profiles, content, and choose and configure marketing channels. We also need tools that can ingest this information, serve it to a target audience, measure engagement, and charge for the service. This will be supported by buyer and seller data, which is, in turn, supported through integration with Ocean Protocol to enable 3rd party businesses to access and purchase it, therefore democratizing access.

Beyond that, and in a dCommerce universe where the work of product search and price discovery is carried out increasingly by Autonomous Economic Agents who serve consumers, collectives or companies (and not just intermediary platforms), we have to wonder will web advertising even exist in its current form?

Examples:
Brave, Fetch.ai

dCommerce primitives

Reputation

Before they decide on a purchase, buyers (or their agents) will often look to someone (or something) who already purchased the same goods, maybe from the same seller, for advice. At other times, they will share their own experiences of goods and services they have purchased.

With time, reputation protocols where participants stake tokens and earn rewards to signal quality of goods, services, sellers, and even buyers, will minimise the need for trust and improve behaviour and experience of all actors in dCommerce. Consistently reliable actors will be trusted more, pay less for credit and insurance, and be able to charge more for their goods and services. While these reputation services will require user data, the data will be sovereign, and the users will willingly submit it for processing.

If we are able to reliably rate each actor, as well as their goods and services, then we don't need to spend as much time searching for products. In fact, if we bring highly-evolved dCommerce reputation and price discovery systems together with Autonomous Economic Agents, do we need marketplaces and product search engines at all?

Examples:
Ink Protocol, Revain

BOSON PROTOCOL

dCommerce primitives

Provenance

Quite often, and now more than ever, buyers want to know where the goods that they are buying came from.

Fortunately, in the ever-accelerating Web3 world we have a number of projects that support tracking of goods and services throughout the entire supply chain, starting with block explorers and more specialised transaction analytics tools. The introduction of Industry 4.0 technologies to dCommerce will facilitate seamless, transparent, and trust-minimized tracking of all goods and services flowing through the dCommerce ecosystem.

For consumers, provenance information is a matter of preference, as some will want to verify that the goods and services that they purchase come from ethical sources. For organisations, traceability of goods and services across the supply chain can be crucial to regulatory compliance.

Examples:
Real Items, 0xCert, Treum, Arianee, Fairchain, Origyn, Datarella

dCommerce primitives

Credit

Sometimes, when they don't have enough funds on hand, buyers will seek credit from a lender, and use it to pay sellers. Conversely, sellers will sometimes credit buyers themselves, if their reputation and credit history makes them seem trustworthy. Products such as credit cards as well as, increasingly, buy-now-pay-later (BNPL), are also serving this purpose in legacy commerce.

Once again, DeFi offers a number of tools for lending, either supported by collateral, reputation, or underwriting, all of which will be easily repurposed to support dCommerce transactions. Although credit scoring will ultimately become native to Web3 - either through scoring historical behaviour of wallets or whole networks of related wallets, web-of-trust models, or buyer curation (itself a monetized form of web-of-trust) - initially it could be sourced from one of the existing Web2 oligopolies. Last, but not least, history of someone's Boson Protocol usage will become a good indicator of creditworthiness.

This will lead to the emergence of decentralized BNPL solutions (e.g. decentralized Klarna), as well as new DeFi lending models, to finance sellers' commitment deposits for Boson Protocol's core exchange mechanism.

Examples:
AAVE, Compound, Centrifuge, Colendi, Celsius.

[35] "What is Buy Now Pay Later? - Money Saving Expert." 4 Mar. 2021, https://www.moneysavingexpert.com/loans/buy-now-pay-later/. Accessed 18 Mar. 2021.
[36] "Decentralized Credit Scoring. Peer-to-Peer Digital ... - Medium." https://medium.com/@jillcarlson/decentralized-credit-scoring-fe2c6c0611c6. Accessed 18 Mar. 2021.

dCommerce primitives

Data

Although commerce generated data from its inception, it was historically ignored, and recently exploited. Nowadays, data is equated to competitive advantage, and it's a pillar on which Web2 giants base their monopolies.

As mentioned, one of the main propositions of dCommerce is to give its participants the ability to retain some control over their data, and monetise it. Instead of capturing users' data and separating them from the value it creates, dCommerce incentivizes voluntary sharing by providing users with an equitable distribution of the proceeds from monetizing their data, should they choose to. Users will be able to monetise access to their data via Ocean Protocol, whilst still enjoying highly personalised, yet private, dCommerce experiences, marketing, as well more accurate pricing of decentralized insurance through use of data oracles.

Examples:
Ocean Protocol

Additional Liquidity

Although liquidity in commerce has many sources, dCommerce will create another one. By introducing new tools to Web3, as well as attracting existing Web2 actors to a fairer and more efficient infrastructure for commerce, legacy and emergent markets will merge together, and new economies will form. Liquidity that they contribute will then be used for other DeFi protocols, hence unlocking additional value in ways that we can't even begin to imagine today.

Much like the initial promise of blockchain in financial markets, as well, later, DeFi, dCommerce will help increase the velocity and utility of capital, not only in financial transactions, but in commerce too.

Examples:
Boson Protocol

dCommerce use cases

From art to virtual bazaars

As dCommerce evolves, so will the implementations of its primitives, and so will the use cases that rely on them. Initially, basic implementations of primitives will power a limited number of use cases, complemented by more traditional eCommerce methods. Over time, and likely sooner than we expect, those dCommerce primitives will become more complete and robust, and actors and marketplaces will start increasingly relying on dCommerce, while eCommerce will be used by exception. dCommerce will start its journey in the consumer space of eCommerce.

A natural inception point will be NFT art, an established, fast-moving, fast-growing Web3 market with an increasing appetite for physical counterparts to digital art. Made by, and for Web3 natives, it is a natural initial use case for dCommerce, with the fewest components to build, and a ready supply and demand.

Not long after, dCommerce will be able to serve gaming and Metaverse communities. In terms of audience, they are quite different: while there already is a budding market for in-game digital-only NFTs, we predict that NFTs will soon transcend their native environment and power in-game purchases, both digital and physical, in mainstream AAA titles for platforms such as Xbox and PlayStation.

As for Metaverse, it's easy to imagine virtual stores and Metaverse bazaars where buyers will be able to examine and purchase physical goods and services, from art, to cars, to limited edition LV bags, to new digital-first physical-second brands that have started emerging in recent years.

Gaming and Metaverse verticals also represent Direct-To-Avatar (D2A) economy[37], which bypasses traditional intermediaries and supply chains, and allows digital-first brands to sell digital wearables for their customers' in-game personas, as well as physical items and real-world experiences. While to some D2A may sound counterintuitive, it is a fast-growing market with an appetite for digital designer goods that sometimes come with real-world counterparts; again counterintuitively, D2A is quickly transcending[38] its native realm, and serving digital fashion for our physical bodies through use of augmented reality[39].

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[37] "Is Direct To Avatar The Next Direct To Consumer? - Forbes." 9 Aug. 2020, https://www.forbes.com/sites/cathyhackl/2020/08/09/is-direct-to-avatar-the-next-direct-to-consumer/. Accessed 14 Apr. 2021
[38] "Digital fashion: This outfit will set you back £780 ... - The Guardian." https://www.theguardian.com/fashion/2021/apr/04/digital-fashion-this-outfit-will-set-you-back-780-and-its-just-an-illusion. Accessed 14 Apr. 2021.
[39] "Augmented reality - Wikipedia." https://en.wikipedia.org/wiki/Augmented_reality. Accessed 14 Apr. 2021.

While not a complex vertical, social media will become important because it will demonstrate the real power of dCommerce over eCommerce. Social networks likely won't require complex or highly evolved dCommerce primitives, but their users will - for the first time - be able to give, sell or exchange real-world goods, services, and experiences, much like they send emojis today, just by pressing a button to transfer a Thing Token or a commitment NFT to a friend or a loved one.

Since all of these Thing Tokens and commitment NFTs will be originally purchased elsewhere, social networks will behave as OTC markets[40] for Things, and in their initial implementation, probably even less than that. Instead of selling, why not just give?

The intermediate goal is to serve fully generic marketplaces as the most complex use case for dCommerce. Anything can be sold, regardless of size, value, volume, frequency, regulation, perishability, and geography. Items can be as large and as expensive as a luxury yacht, or as small and as cheap as single-use coffee creamers. Every eventuality needs to be taken into account.

From thereon, convergence of Autonomous Economic Agents with DeFi markets for Things will become the new nexus for supply and demand, gradually reducing our reliance on marketplaces.

[40] "Over-the-counter (finance) - Wikipedia." https://en.wikipedia.org/wiki/Over-the-counter_(finance). Accessed 18 Mar. 2021.

BOSON PROTOCOL

dCommerce use cases

Primitive Matrix

● Mandatory　　　◐ Somewhat needed　　　○ Not needed

	NFT Art	Games and metaverse	Experiences	Social	Marketplaces
Payment	●	●	●	●	●
Commitment	●	●	●	●	●
Exchange mechanism	●	●	●	●	●
Fulfilment	●	●	○	○	●
Identity	◐	◐	◐	○	●
Legal agreement	◐	◐	◐	○	●
Disputes	◐	◐	●	●	●
Data	◐	◐	●	●	●
Price Discovery	○	○	●	○	●
Insurance	◐	◐	●	○	●
Marketing	○	●	●	○	●
Reputation	◐	◐	◐	◐	●
Provenance	●	●	○	○	●
Credit	○	◐	●	○	●

Figure 3

dCommerce use cases

From Web2 to Web3

While the rest of the world has been steadily moving on from Web2 and into Web3, dCommerce will, at least for a while, travel in the opposite direction. Conceived in, and created for Web3, it will need to connect and interact with Web2, as this is where the majority of supply and demand is. Furthermore, Web2 is where eCommerce incumbents operate their extractive monopolies, and therefore a place that dCommerce can change by introducing a fairer, trust-minimsed infrastructure for the exchange of goods and services.

The majority of crypto users rely on custodial digital asset exchanges, and do not use Web3 natively. The challenge of user education is not insurmountable, but - in the interest of speed - the question is really whether dCommerce waits for users to come to Web3, or extends its reach in order to acquire custodial-oriented crypto natives, as well as tens of millions of sellers and buyers that never encountered crypto in their lives.

With time, the two worlds will converge into one, but we will need to help it along the way. The middle ground is a Web2.5 dCommerce stack, where users can choose between trust-minimal, and trust-delegated solutions.

In predicting how commerce will look like once dCommerce becomes mainstream, one thought rings truer than most: large, entrenched eCommerce platforms are difficult to change, and the majority will fail to adapt to dCommerce successfully.

dCOMMERCE PROGRESSION

Web-3 only

- Payments
- Refunds
- Commitments
- Exchange Mechanism
- Fulfilment

Limited Web2 Integrations

- Disputes
- Price Discovery
- Payments
- Returns
- Commitments
- Exchange Mechanism
- Fulfilment
- Identity
- Credit
- Insurance
- Data

Mutually Embeddable with Web-2

- Legal Agreement
- Marketing
- Disputes
- Price Discovery
- Reputation
- Payments
- Returns
- Commitments
- Exchange Mechanism
- Fulfilment
- Identity
- Credit
- Insurance
- Data
- Provenance
- Organizations

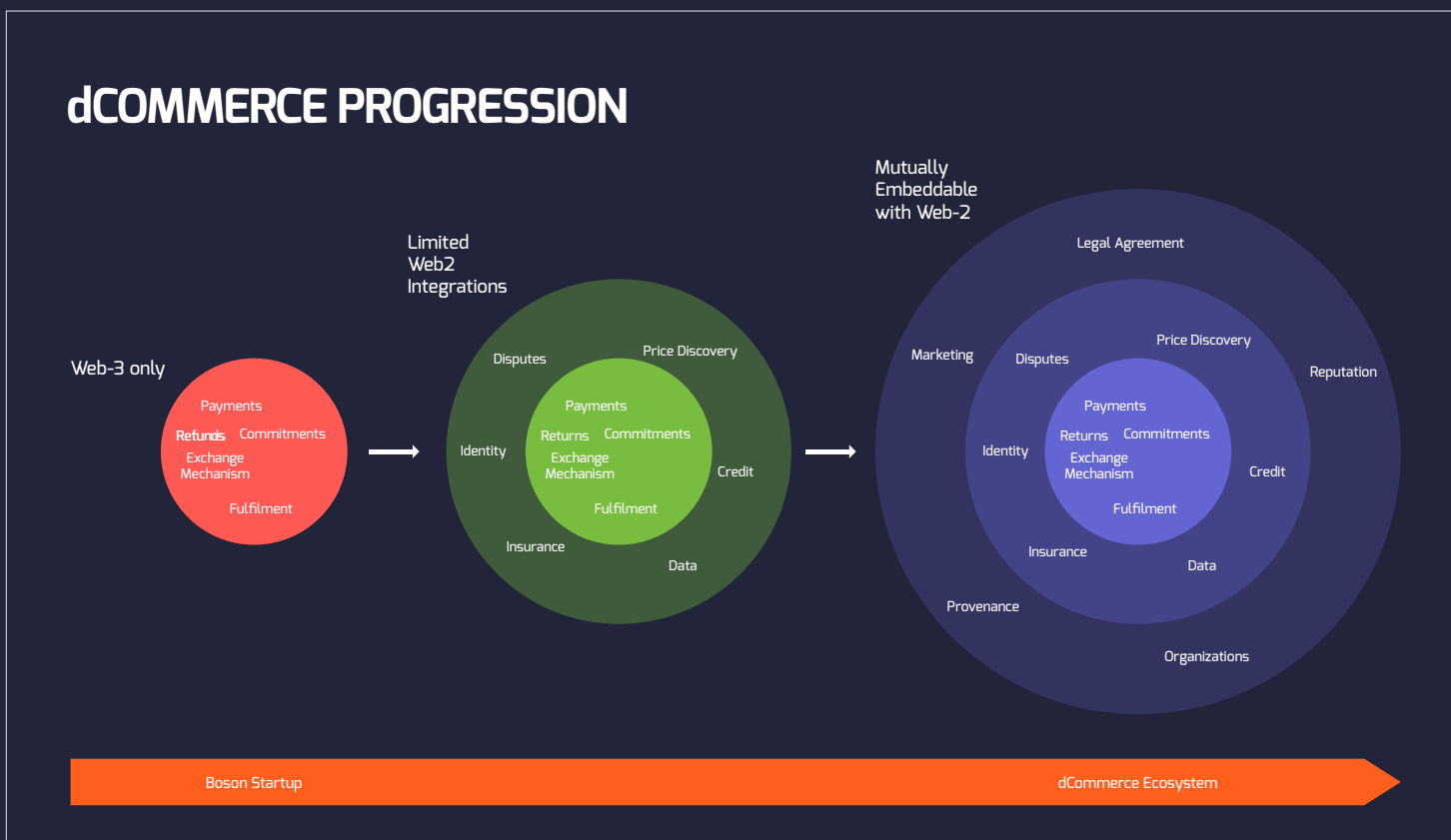Boson Startup → dCommerce Ecosystem

Figure 4

dCommerce use cases

From Corporation to DAO

During their forays into Web2, in order to be able to navigate the world of legacy legal entities, and facilitate processes such as M&A, Web3 organisations may have to become corporations too.

Later, and with ecosystem evolution, dCommerce corporate entities might decentralize into DAOs structured to ensure regulatory compliance, while retaining fair and transparent distribution of ownership, value and control.

dCommerce Ecosystem

With time, the dCommerce ecosystem will reduce reliance on Web2 eCommerce structures entirely by funding and enabling the development of a dCommerce stack of specialized applications, and attracting supply and demand from legacy markets. To kick start this, Boson, as a relatively centralised organisation, is developing a library of developer tools and a number of reference applications including the core protocol that satisfies early payment, commitment, exchange and fulfilment primitives, as well as a p2p reference application for real world redemption.

With the introduction of Boson Protocol's ERC20-based Thing Tokens, we will enable a more convenient interface for Web3 applications to interact with physical goods and services. Thing Tokens effectively will become the on-ramp for things into dCommerce, and Commitment Tokens the off-ramp into executing exchanges. Every addition of a specialized protocol benefits the ecosystem as a whole, and expands the number of possible interactions and use-cases, resulting in stronger network effects. This is what we call an Open Tokenized Economy.

Existing DeFi infrastructure can already addresses some of the core components of dCommerce:

| dCommerce primitive	Sample components
On/off-ramp	Coinbase, Kraken, Binance, Coinpass, Eidoo, Orion, Coinburp, BitHolla. Circle, Wyre. Uphold, Paxos, Ramp, GoCoin. CoinPayments, SatoshiPay, AlchemyPay, Dharma.
Payments	DAI, USDC, USDT, BUSD, Paxos, Moneyfold. Metamask, TrustWallet, MyCrypto, Argent, InstaDapp, Zerion, Ledger, WalletConnect, Dharma, LeadWallet, Fuse, Amasa.
Commitment	Boson Protocol
Exchange mechanism	Boson Protocol
Identity	Civic, Sovrin, Evernym, Crucible, Serto, Blockpass, Ceramic, Element, 3box.
Legal agreement	OpenLaw
Organisations	LAO, Aragon, Colony, DAOStack
Disputes	Kleros, Aragon Court
Price discovery	Uniswap, Kyber, Balancer, Curve. Coinbase, Kraken, Binance. dYdX, 1inch, DEX.ag, 0x, AirSwap. YOP Finance
Fulfilment	DHL, Fedex, UPS, DPD
Insurance	Nexus Mutual, Bridge Mutual, Etherisc, Cover Protocol
Marketing	Brave, Fetch.ai
Reputation	Ink Protocol, Revain
Provenance	Real Items, 0xCert, Treum, Arianee, Fairchain, Origyn, Datarella
Credit	AAVE, Compound, Centrifuge, Colendi, Celsius.
Data	Ocean Protocol, IPFS, Gather, Swash
Additional liquidity	Boson Protocol
AEAs	Fetch.ai, SingularityNET

Figure 5

dCOMMERCE ECOSYSTEM
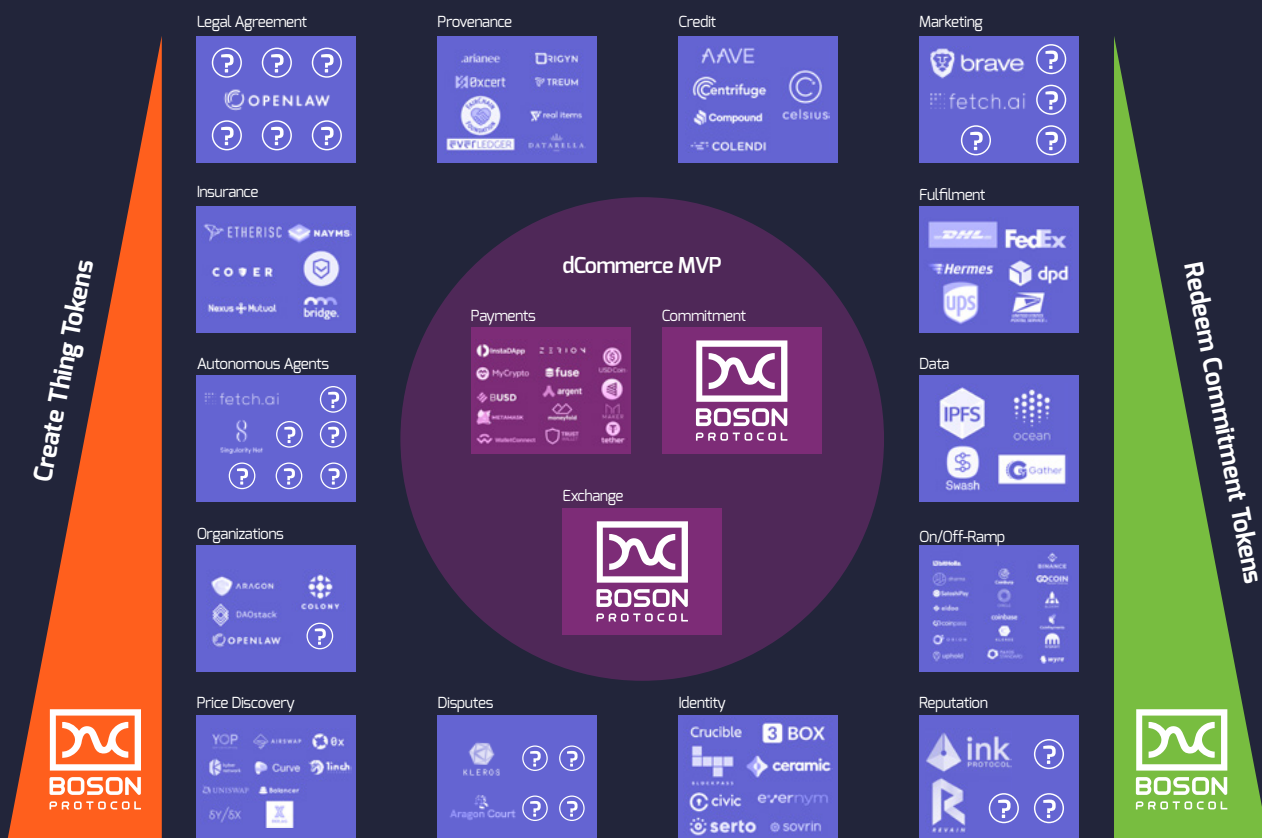
Figure 6

dCommerce use cases

dCommerce Challenges

dCommerce, in its current iteration, does not replace all the functions of a mature eCommerce platform. While the end-goal is complete automation of commerce, it is still far away, and consequently some cases will require arbitration or other types of workarounds. In other words, there are tradeoffs that we need to explore in the short-term, and hard problems that we need to solve as soon as possible.

Let's examine the immediate challenges:

Quality, Returns, and Refunds

If someone buys an item, and later discovers that it is substandard, they will want to return it to the seller in order to receive a refund. In some cases, a refund will occur without a return (e.g. when the buyer purchases a service, not a tangible product). For compliance purposes, sometimes the consumer must have the option of a return followed by a refund.

Although the current version of Boson Protocol exchange mechanism does not support returns and refunds after the commitment NFT has been redeemed, there are potential solutions to the problem.

The solution is to adjust the core exchange mechanism so that funds are held in escrow for a period of time after the item has been delivered. The buyer will have the opportunity to return the item within that period, and receive a refund upon return.

In the interim, insurance could cover the refund: the buyer pays for insurance at the moment of purchase, increasing the cost, but having the option of a refund. There are a couple of challenges with this solution; one is ensuring that buyers don't misuse the insurance; a refund should occur only after the item has been returned.

The problem could be alleviated through use of reputation mechanisms, which will steer buyers away from products and sellers with poor reputation.

Escalated Arbitration

Situations where seller and buyer disagree on the outcome of a transaction will require arbitration, which has a cost.

One, partial, solution to this problem is the use of Web3 arbitration services, such as decentralized courts[41]. Some cases may require human arbitration, at least until effective machine arbitration tools emerge.

Arbitration could be funded from seller and buyer deposits, as well as from yields on funds stored in Boson Protocol's escrows. As mentioned earlier, because Boson Protocol's core exchange mechanism escrows funds, it is, in fact, a pool of liquidity. This liquidity can be deposited in DeFi protocols to earn returns.

In this case, liquidity modelling will be crucial to ensure that the total funds available for arbitration always exceed its total cost.

Funding Commitments

In the current implementation of Boson Protocol's core exchange mechanism, a seller has to commit their deposit at the moment of listing an item. While for some cases this does not pose a problem, for others it might make listings impractical.

If a seller wants to list a thousand identical items, then they have to commit a deposit for each of them upfront, which impacts their working capital.

One potential solution to this problem is the use of credit available in DeFi. For example, a seller's business assets might be used as collateral for credit, whose interest rate is determined by the seller's past behaviour.

Scalability and Transaction Costs[42]

At the moment, this is a problem that pervades much of Web3, given its current reliance on Ethereum. It also makes much of dCommerce unfeasible, given that low throughput and high gas fees would greatly reduce the volume of dCommerce transactions, as well as tilt the price of goods and services towards the higher end of the scale.

To address this, Boson Protocol plans to implement a layer-2 scaling solution[43] in the near future. At a later time, and with development of new Web3 ecosystems, it is likely that the dCommerce ecosystem will expand to include other networks, where scalability and transaction costs will not be as severe.

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[41] "Kleros." https://kleros.io/. Accessed 12 Mar. 2021.
[42] "What happened to network fees?! Understanding how Ethereum gas ...." 12 Jan. 2021, https://medium.com/the-adex-blog/what-happened-to-network-fees-understanding-how-ethereum-gas-works-7588d1ae46ff. Accessed 18 Mar. 2021.
[43] "How Ethereum Layer 2 scaling solutions address barriers to ...." 2 Dec. 2020, https://entethalliance.org/how-ethereum-layer-2-scaling-solutions-address-barriers-to-enterprises-building-on-mainnet/. Accessed 18 Mar. 2021.

dCommerce use cases

Collective Intelligence

While some may say that dCommerce is not yet ready for prime time, we disagree, in part.

To quote The Innovator's Dilemma[44]:

1. *Improving a product takes time and many iterations. The first of these iterations provide minimal value to the customer but in time the base is created and the value increases exponentially. Once the base is created then each iteration is dramatically better than the last. At some point the most valuable improvements are complete and the value per iteration is minimal again. So in the middle is the most value, at the beginning and end the value is minimal.*

2. *The incumbent has the luxury of a huge customer set but high expectations of yearly sales. New entry next generation products find niches away from the incumbent customer set to build the new product. The new entry companies do not require the yearly sales of the incumbent and thus have more time to focus and innovate on this smaller venture.*

For these reasons, the next generation product is not being built for the incumbent's customer set and this large customer set is not interested in the new innovation and keeps demanding more innovation with the incumbent product. Unfortunately this incumbent innovation is limited to the overall value of the product as it is at the later end of the S-curve. Meanwhile, the new entrant is deep into the S-curve and providing significant value to the new product. By the time the new product becomes interesting to the incumbent's customers it is too late for the incumbent to react to the new product. At this point it is too late for the incumbent to keep up with the new entrant's rate of improvement, which by then is on the near-vertical portion of its S-curve trajectory.

Here's a well known example: 25 years ago, not many people believed that digital cameras would disrupt the dominance of their analog counterparts, and yet, they are now reduced to a nostalgia-tinged curiosity. Analog cameras are interesting because they produce delightfully flawed results, and are cool in a way that vintage clothing is cool. They don't have great utility, and they aren't particularly cheap or easy to use.

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[44] "The Innovator's Dilemma - Wikipedia." https://en.wikipedia.org/wiki/The_Innovator%27s_Dilemma. Accessed 11 Mar. 2021.

Digital cameras became the success that they are because, initially, their creators and users accepted that they are flawed, and would continue to be for a while. They also expected them to improve dramatically with time, and worked together to achieve that.

Much in the same way, we expect dCommerce to improve with time, and entirely disrupt legacy commerce. That said, great disruption requires great effort, and also a great community of experts, builders, and users to collectively innovate. Much like the dCommerce stack, this community also has its building blocks: experts in eCommerce and Web2 platforms, to teach us about the processes and the needs of actors in legacy commerce; experts in game theory and protocol design, to create novel interactions between actors, and ways of incentivising them; experts in law and governance, to help us design the dCommerce DAOs of tomorrow; experts in ecosystem development and token engineering[45], to ensure that the ecosystem value grows with time, and flows fairly between all of the participants. Finally, we will need many others to build, market and operate the dCommerce stack, as well those early, adventurous adopters to use it.

Here is how Boson Protocol plans to spark innovation in the dCommerce community:

Research Groups

dCommerce has presented us with a number of hard problems, and we believe that the way to solve them is through collective intelligence. The first step in solving a complex problem is to analyse it, and outline the requirements for its solution. Boson Protocol will offer small bounties to those who break down dCommerce challenges into detailed research questions and proposed solutions.

Web2 Platform and eCommerce Experts

Even though dCommerce consciously diverges from legacy business models, we should acknowledge that knowledge pooled in eCommerce and Web2 platforms is invaluable in building a successful dCommerce ecosystem. Experts in platform strategy, channels, logistics, operations, and more, will help us further define dCommerce challenges, and suggest best practices.

dCommerce Projects

Some of the proposed solutions will evolve into separate dCommerce projects, with Boson Protocol's providing the resources and expertise. To help further that plan, Boson Protocol will work with Outlier Ventures to create a dCommerce track within their Base Camp Accelerator programme, which will focus on creation of ecosystem projects.

[45] "Hello from Token Engineering | Token Engineering." https://tokenengineeringcommunity.github.io/website/. Accessed 18 Mar. 2021.ssed 11 Mar. 2021.
[46] "Base Camp Decentralised Tech Accelerator | Outlier Ventures." https://outlierventures.io/base-camp/. Accessed 18 Mar. 2021.

Token Engineering Community

At the moment, we see the scarcity of token engineers as one of the bottlenecks for Web3. Having assembled a great token engineering team, Boson Protocol will support the education of new talent, who will, in turn, help design future tools for Web3 and dCommerce.

Furthermore, Boson Protocol will become a part of the introductory token engineering curriculum, therefore giving the token engineering community the opportunity to learn about Boson Protocol, and vice versa. In time, some elements of the students' coursework could be absorbed into Boson Protocol's technical documentation, which could then evolve into a Boson Academy website.

Moreover, Boson Protocol will create an open innovation environment for token engineering students to help solve those hard problems with support from our token engineering team. This will further increase the inflow of committed talent to dCommerce, and provide us with additional insights in exploring the solutions.

A look into the future.

It's difficult to foresee how dCommerce, in its most successful version, might influence our lives and societies. Perhaps its most novel feature is that - in a sense, and at its edges - dCommerce helps dematerialise physical products into uniquely attributed digital artefacts that travel through networks like information (Web1) or value (Web3), and rematerialise at the other end.

And precisely because physical objects could be treated a little bit more like information or money, it's likely that we will learn to use them in new ways. We will certainly be able to create secondary markets for all things, not only commodities. We will be able to securitise physical objects - unique or mass-produced - and buy them on a margin, or use them as collateral for borrowing. We will partake in autonomous co-ops that aggregate buying power and negotiate better terms for its members. Buyer credit (or seller working capital) will be autonomously negotiated, supported by decentralized credit ratings (so honest behaviour pays), and, if needed, underwritten by someone else.

Just as importantly, because Things, at least for a portion of their lifecycle, become data, we will be able to analyse it to understand and fulfil our own needs much better. Autonomous economic agents will study our past behaviour, and learn how to act on our behalf, therefore freeing us from making decisions, seeking out products, getting funds, and worrying about delivery and quality. Much along the same lines, we will be able to analyse entire markets and jurisdictions, and learn where our money works best, or how to position our businesses and products.

While there are several hurdles to overcome, a minimally extractive, permissionless dCommerce ecosystem could provide hitherto nonexistent infrastructure for commerce in the developing world, much like cryptocurrencies are now supplanting their antiquated banking systems.

From thereon, we foresee dCommerce moving on from the B2C realm, and into B2B, supporting wholesale and trade finance, as the mechanisms and the building blocks will be similar, however the scale and the actors will be different. One important area to consider will be detection of counterfeit goods, which have traditionally been a challenge for both industries. The point of trust will move farther from the exchange and finance functions of dCommerce, and closer to participants. Reliable valuation of items and shipments will remain a problem to be solved.

And after that? Who knows...

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[47] "Cryptocurrencies: Why Nigeria is a global leader in Bitcoin ... - BBC." 28 Feb. 2021, https://www.bbc.com/news/world-africa-56169917. Accessed 11 Mar. 2021.

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