embermine

**Decentralized Creative
Commerce Platform**

White Paper v 1.1.1

Fall 2017

ABSTRACT

The creative spheres have been dominated by corporate intermediaries that are wholly profit-minded and insensitive to the needs of creative entrepreneurs in the digital age. With the rapid development of automation technologies in all areas of industry, in the areas where manual, dangerous, or repetitive tasks are the norm, the very composition of the workforce will evolve faster than many will expect. Because of this, it is imperative that creatives have access to tools that can provide sustainability and agency in their endeavors during these times. Below we present the vision and design of the Embermine Platform and how it utilizes a lightweight blockchain protocol, smart contracts, scarce digital assets, and autonomous agents to bring pseudonymity, secure collaborative relationships, automated revenue/royalty share, providence and distribution of creative assets, and a sustainable secondary market within reach of creative entrepreneurs.

INTRODUCTION

"

I must create a system, or be enslaved by another man's.

I will not reason and compare: my business is to create.

"

—WILLIAM BLAKE, JERUSALEM

Many different technologies are accelerating in their development and implementation in society. This might seem both strange and wondrous to us since it has the appearance of fiction crossing over into reality. Artificial intelligence. Advanced robotics. Virtual and Augmented reality. New modes of transport. However, in the context of wider society, we tend to let the novelty, or science fiction familiarity, of this techno-social revolution cloud our judgement. The truth is that these technologies, particularly the automating sort, will remove people from many different networks of value—except for the occasional specialist. No form of commerce will be untouched by these technologies.

While much is said of the projected loss of blue-collar jobs in labor and transportation, any job built on the fundamental substrates of mathematics—accounting, entry-level programming, analytics—are also at risk.

In this future, people will need the right tools to utilize their creative/collaborative potential to maximize the value they create in their endeavors. Currently, the systems within reach of creative entrepreneurs are not sustainable solutions. Much of the value goes upstream away from the people who are expending their time, energy, and talent to bring goods and services to the world. The value is extracted upwards to the masters and gatekeepers of these systems. This extraction-based protocol plagues all areas of commerce: physical, digital, and everywhere in between. We believe that building a more inclusive and sustainable form of creative commerce requires a study of the fundamentals.

Creative Commerce in Physical Space

Before the rise of industrialism and mass manufacturing in the 19th century, the economic model of the creative sphere was largely artisanal i.e. the creative artifacts were handmade and unique, a unique product of the creative's imagination or a commissioned work. The Gutenberg printing press ignited the spread of stories and histories with the capability of making copies of manuscripts. No lon-

ger did people have to wait for scribes or monks to painstakingly recreate what they deemed to be the essential texts and then keep them at the monastery. Monastic distribution networks are far from ideal when the foundational tenet of the order is isolation from wider society. This also makes the integrity of the works questionable as there is often no genesis work to compare with the "copies" to check that changes hadn't been made, out of motive or negligence. Attribution and integrity of creative works have been persistent problems in the physical world.

The main way artists avoided starvation or lack of shelter was by finding a patron, someone of status in society, willing to leverage their power (money) to provide for the artists in exchange for exclusive access to their talents. This often led to artists compromising their ideals to survive—an unfortunate exchange. Before the commercialization of the internet, a writer or musician could either distribute their work independently through their friends and family or through a publishing company/record label that used its resources to manage and facilitate the business operations surrounding the artists and their creative output.

In its own way, creative artifacts limited to physical space afford a certain sense of value and scarcity. While many can be/have been destroyed by negligence of owners or nature itself, when we hold a book in our hands, we are holding one unit of a finite supply printed by a publishing company or an affiliated entity. Due to supply and demand or other conditions, there may be new editions released or second printings, but scarcity still applies, making it subject to the price mechanisms of market forces and the whims of vendors.

After publication, physical works of art are distributed to vendors who then return a certain portion of the revenue generated as per the royalty agreements. However, after this initial distribution—as soon as the books, LPs, CDs, etc. are in customers' hands—the creators of these works are cut off from all the subsequent value generated.
When someone owns a hardcover book or an LP, they own a tangible token of interest (non-finan-

cial denotation) that can connect that individual to a genre, subculture, or other domain of interest. While this does have value of a sort, it does little in the economic reality of the creative entrepreneur.

Creative Commerce in Digital Space

The commercialization of the internet did not really take off until the user experience of browsing and the implementation of the HTTPS protocol allow for individuals to interact and transact with one another with relative security ["Commercialization of the Internet"]. The combination of having the right tools in place and the presence of public interest, corporate entities quickly attempted to stake their ground knowing that domination of this new frontier would result in incredible gains and foothold in something big.

Despite the internet-fueled boom that played out during the remainder of the nineties into the turn of the century, creative commerce in this new age of the internet didn't really come to the forefront of the public consciousness until Napster and the discourse on file-sharing and its disruption of the music industry. This development showed the near infinite abundance that digital environments afford creative works. The cost-savings and the ease of access were too irresistible for many consumers. This presented a problem for creatives as sales of their hard assets (CDs, books, movies) began to plummet to industry lows.

Later, creatives would turn to e-commerce solutions built by the survivors of the dot com bubble. The illusion of their efficacy is only in their market presence; their design leaves much to be desired. There is no alignment of incentives between the users of these platforms and the corporate entities simply seeking to dominate a Darwinian marketplace where only the strongest survive.

The important takeaway here is that the internet proved itself to be an effective distribution mechanism. The creators may have been easily shut out of the value, but a dispersal method that can transcend time and space in ways that physical methods cannot certainly has its merits amidst its questionable implementation.

Bridging Physical/Digital Divides

A retrospective into the past and current methods of creative commerce show a persistent, fundamental difficulty in dealing with the material and the immaterial.

For a long time, we lacked the technical capabilities to bridge this gap, to break the dichotomy of physical vs. digital, and to allow some of the advantages of each to cross over.

Then Bitcoin and a host of derivative and other technologies challenged our notions of what commerce can be in an interconnected world.

Technology Context: Bitcoin

On October 31st, 2008, some anonymous person/persons under the alias Satoshi Nakamoto released a white paper, "Bitcoin: A Peer-to-Peer Electronic Cash System" on a cryptography mailing list. The paper outlined a financial system that did not rely on trusted third parties but rather cryptographic mechanisms to eliminate the double-spending problem and the centralization of vulnerabilities (Nakamoto 2008). The Bitcoin network went live January 2009. The Nakamoto protocol implemented clever cryptography to create a novel financial application, a medium of exchange without masters. This alien fintech drew upon decades of research in the areas of public-key cryptography and digital cash systems, succeeding where those attempts failed by eliminating the variable of the vulnerable, centralized server and instead introducing the data structure that became known as the blockchain, a distributed, cryptographically verifiable database underlying the Bitcoin currency.

The real magic of Satoshi's opus, however, was found in the redefinition of the digital object. Before Satoshi's white paper, the identity of a digital object was defined mostly within the context of its presumed greatest ability: infinite duplication and malleability. While these are essential elements

that were the groundbreaking tools that led our foray into the digital realm, they also led to unintended consequences as they evolved. Most of the industry uses developed to take advantage of new digital technologies focused upon and leveraged these two qualities.

Satoshi revealed, however, that a more powerful side of the digital object exists. One where all digital objects are defined by their certainty and scarcity. The evidence of the impact of these factors is found in the qualities of the infinite digital object as well. Because it is defined by its lack of scarcity, there is a noted lack of certainty in any transaction involving an infinite digital object. The ultimate nature and power of digital objects is enforced and maximized through the leveraging of its own elemental certainty. True or False. 1 or 0.

Once this certainty can be utilized, the digital object becomes resilient, sometimes "antifragile," and can organize itself into the specific, defined quantities of serialized inventory. Even at a million defined elements, a digital object with a defined inventory of known objects, is inversely more certain and scarce than the infinite digital object.

Obviously, many companies have leveraged infinite digital objects to great advantage, and continue to do so, but their success was always dependent upon the centralization of resources and data protection. It is the centralized systems that provided the (artificial) certainty and scarcity needed. This is declared as "artificial" because the elements of certainty and scarcity are not innate qualities of infinite digital objects. They are instead created by the forced centralization of access, payment, and verification.

The success and growth of Bitcoin in the light of challenging the world's legal, economical, and even political notions regarding the use of digital objects, has done little more than legitimize the philosophy behind Satoshi's work.

Technology Context: Programmable Blockchains

Bitcoin was designed for the singular purpose of its financial application as an alternative currency to challenge the existing establishment. While there were non-financial applications such as "proof of existence," a method of timestamping and hashing a unique digital document, the Bitcoin protocol lacked versatility due to its lack of extensive scripting capabilities— programmability—necessary to develop a wider range of applications. This limitation prompted Vitalik Buterin to propose a new blockchain platform that allowed developers to write and deploy smart contracts— programs that execute on a blockchain— thereby allowing the development of a wide range of decentralized applications (Dapps). Ethereum is a decentralized "world computer" which requires Ether, the protocol currency, to run computations (Buterin 2014).

The notion of the smart contract was originally proposed by Nick Szabo in 1994 before there were any systems capable of actualizing it. The essential thesis: since contracts are "imbedded in the world," in the many facets of our personal and business relationships, it is possible that programmable contracts could facilitate all manner of peer-to-peer interactions and transactions, thus opening many economic opportunities previously unavailable ("Smart Contracts" 1996).

Currently, there are many projects tackling different areas of commerce and finance using blockchain-based architecture, or even building new protocols upon which to build these applications. Whether or not these efforts result in mass adoption of blockchain, cryptocurrency, and decentralization depends on the developers and entrepreneurs in the space keeping the end users of these systems at heart.

Intent is paramount.

Pieces Form a Whole

What we have here is the scaffolding for a new architecture of decentralized systems, simultaneously antifragile and inclusive. The efforts of cryptographers such as David Chaum, Hal Finney, Ian Grigg, Nick Szabo, Satoshi Nakamoto, et al are coalescing into form and purpose as technologists and entrepreneurs challenge the status quo and the powerful monopolies of the world, creating sustainable tools of commerce fit for the overwhelming pace of society.

A lot of the frictions of the world are due to uncertainty: of purpose, of intent. Blockchain and the general notion of triple entry accounting allow a neutral source of certainty in an increasingly digital world, thus making possible security, pseudonymity, and confidence in one's business endeavors.

Solve et Coagula

An interesting axiom of the alchemists was solve et coagula. Solve was the process of taking something apart into its individual components to see how they were fashioned together and see where the flaws lay in the design. Coagula was the process of synthesizing these components into new forms that marked an improvement over the previous iteration. As with many subjects pertaining to the alchemists, this has the dual function of being perceived literally or metaphorically, applied to mechanical processes of physical matter or to the mental and social structures that form the operating systems of our lives.

WHAT IS

EMBERMINE?

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The Embermine Platform is a smart, decentralized creative commerce platform designed with the creative entrepreneur in mind.

By leveraging the aforementioned technologies—including the algorithms that may eliminate jobs in some sectors—and combining the best elements of physical and digital commerce, we can design a set of tools that can allow individuals to interact and transact with one another without the need of middlemen and without sacrificing their self-sovereignty.

To do this, the platform must provide the following:

1. Presence
Pseudonymous social and economic avatars able to operate without sacrificing accountability or privacy

2. Connection
The means to utilize one's social graph to invite collaborators into the network or seek them within

3. Collaboration
The implementation of programmatic agreements and no-nonsense intent clauses between parties to govern and streamline the collaborative process

4. Creation
Create nonfragile crypto-assets/tokens as bearer instruments granting ownership of a wide variety of creative works

5. Distribution
Provide a dynamic means to distribute creative assets and leverage network effects

6. Marketplace
A sustainable secondary marketplace in which the circulation of assets produces value for the creators and consumers alike (with the help of algorithmic trading bots)

7. Provenance
Maintain connection between creatives and the works they release into the market; IP protection

8. Resilience
A better alternative of digital rights management that combats piracy whilst maintaining connection to the Embermine ecosystem

9. Signal
Allow for more meaningful interactions between entities that amplify network presence without paying for leverage

10. Structure
To create a versatile and vibrant economy, we've designed a trine-token ecosystem for network access, event/project access, and transactional capability

Trine-Token Ecosystem:
A Short Primer

Before we detail the various elements of the Embermine Platform, it is important to outline the token design of the ecosystem for clarity's sake as it is interwoven with the design and processes that follow.

There are three types of tokens on the platform: the seat license, creative assets, and the transactional unit.

• Embers (MBRS) are seat licenses for the Embermine Platform which establish access and presence in the ecosystem of creative commerce toolsets, applications, and goods and services produced therein. For each unique User ID, an Ember is locked and taken out of circulation. (Users)

• Creative asset tokens are generated by Projects, functioning as digital bearer certificates proving ownership of purchased goods: books, music, film, etc. (Products)

• Ions are the transactional and stable unit of value required to participate in commercial activity. They enter the market because of Embers being removed permanently from the network. Intended for high-velocity.

The Embermine Constitution

The blockchain is a shared ledger of discrete events constituted in a cryptographically secure data structure. If the transactions are verified and validated in the consensus protocol, the narrative will persist indefinitely. The design and structure of the Embermine Platform is human-centric, for the characters in the narrative are necessary for a dynamic and prosperous network. Since the human element is inseparable from the abstract data in the context of a network participants, such systems require governance.

Governance in decentralized networks presents a challenge as the total lack thereof can produce toxicity amongst the human nodes or cause instability or obsolescence within the software itself. A notable example of this is the forking of blockchain software. Such events arise when there is lack of social consensus or clarity of intent behind the community. Politics amongst miners, developers, or others with vested interests can inhibit the growth of a network relying on a blockchain accounting system. The people who rely on these systems indirectly through applications or businesses running the software should not have to experience the stagnation or volatility that arises when there is lack of a fair governance structure.

Most blockchain environments operate under the axiom "code is law," which places the data structure and its processes and functionality above the human element. Most of these networks rely solely on crypto- economic schemas which are often defined and implemented in such a way as to inhibit the purpose (if present) of the network with the emergence of influencers, cartels, and other entities basking in the "might is right" ecosystem. When the goal is to maximize human potential, putting the machinery on a pedestal seems outright ludicrous.

The Embermine Platform will use a constitution as the foundation of governance. This is inspired by Dan Larimer's research on governance models for the EOS blockchain operating system (Larimer 2016). This document will detail the general rules and associated roles within the environment, define the areas of accountability, set methodology of dispute resolution, and cement the core values of the network to be accepted by all participants.

Intentionality is a crucial element to the platform. As contractual relationships are one of the main components of commerce between collaborating Entities, the constitution takes this model and applies it throughout the entire network in a system- wide, generalized contract. From the user perspective, this is not unlike a terms and conditions clause. What makes this document different from the average TC is that it is possible to define and enforce the values of the network rather than focusing entirely on the rules. Constraints are fine and necessary to define any operating structure,

but if they are too many and too granular it will inhibit the growth of the network.

Who is affected by the constitution? The simplest answer would be the user, but since the Embermine Platform could be the operating system on which creatives and projects run their accounting system and business processes, are the users of those applications and services in turn affected by the constitution? Where does privity of contract end in this chain? A lot of this is contextual as some projects launched on Embermine may choose to default to the original constitution or draft and implement their own. The exact minutiae of this framework are still being defined. Ideally, this document should be static, changing only with the overwhelming indication of the community. A governing document revised over time with accumulating edge cases loses its simplicity and clarity.

In practice, the constitution will be presented to the User upon entrance into the network like a terms and conditions clause. The process of verifying one's unique User ID and creating the first pseudonymous Entities for interacting and transacting on the platform requires a cryptographic signature of the constitution by the new user. The hash of this document will be included in every subsequent transaction throughout the network, showing that the user behind the pseudonymous Entity has agreed to the same parameters. This satisfies privity of contract, where only the parties to the contract can contest the contract and initiate a dispute.

Blockchains can allow distributed accountability amongst all network participants and do so in a manner that does not compromise the User's privacy or self- sovereignty. However, the processes involved are facilitated through software, so the users as well as the developers of the platform are beholden to the constitution. No exceptions. The goal is to create mechanisms and frameworks that allow intentional interactions and transactions in specified, unambiguous contexts with consent of all parties involved.

Next, the conceptual thorn that has challenged philosophers and computer scientists alike: **identity**.

"Who are You?" The Problem of Identity

To untangle the difficult notion of identity, we once again fall back to the dichotomy of physical vs. digital. In physical space, we often define identity as an indicator of a unique flesh-and-blood human being with a singular, persistent personality. Actual experience would indicate that the domain of one's identity is not singular, but plural. If someone, due to disease or trauma, loses all memory and semblance of who they are or were, identity extends from that individual to their network of peers, their social graph. There is also the actual experience of identity wherein we behave differently in different contexts. We are multifaceted. We contain multitudes.

Identity is not singular. It is correlative.

In digital space, identity presents an even bigger challenge because we lack the face to face interaction that creates trusted relationships. Networks are subject to Sybil attacks, in which one bad actor can create a multitude of identities to overtake or hinder the network. Sybil-resistance is a key requirement for any decentralized system.

As stated above, one of the important elements in establishing a presence in this platform is pseudonymity that does not sacrifice accountability or privacy.

The Value of Pseudonymity

It seems that the use of pseudonyms is quite natural in two areas of activity relevant to this project: creative and online environments.

The creative sphere is full of artists who choose other identifiers: stage names, screen names, pen names, alter egos, etc. Sometimes this is part of a performance, a conscious attempt to create an aura of mystique and intrigue, an aesthetic, that the art-

ist and audience alike can tune into. Some writers, such as Stephen King and J.K. Rowling, have at some point chosen not to leverage their fame for certain works, so they use pen names (until their real identity is discovered, which is common in such cases.)

The rise of the internet brought a flourish of new identities. People could communicate with one another in relatively private channels. The constraints and social mores of physical interactions no longer applied. The Cypherpunks of the nineties valued pseudonymity and anonymity as fundamental rights of people within the developing surveillance state, so many of these computer scientists and cryptographers set out to develop more secure methods of encryption to protect the public.

As technologist David Birch writes in Identity is the New Money, "All of the identities we exchange are virtual, and while the virtual identities are of course linked to our mundane identities, they should not be confused. None of them is 'real'...all identities are pseudonyms" (Birch, 2014).

ONTOS: The Embermine Identity System

The Embermine Platform allows creative entrepreneurs and their customer base to generate pseudonymous "economic avatars" (Lanier, 2013) through which they can interact and transact with one another in creative commerce. We call these Entities.

In keeping with the spirit of creative and digital personae, creative entrepreneurs can generate multiple identities for a variety of contexts; however, this is not without some necessary limitations.
Entry into the platform is invitation-only. This not only allows the network to grow organically as creatives invite their friends and frequent collaborators into the fold, but also helps establish a network built with human nodes, where the connections and points of convergence are key. Ian Grigg's notion of identity as an "edge protocol" (Grigg, 2017) rather than a nodal one resonates here, since we are emphasizing in our design the social graph of individuals and connections therein rather than static features as mundane as name, date of birth, or So-

cial Security number (or some equally extraneous variable implemented outside the US) supplied by a central authority.

The crypto-asset, Embers (MBRS), are seat licenses required to enter the ecosystem. The first step is to generate a User ID, a human-unique identifier. This is the root ID in the system that establishes presence, the mundane identity of the creative entrepreneur or customer. This is important if we want to crystallize that individual's presence in the network and verify that he or she is not duplicitous. User IDs, however, are not visible Entities on the network but rather a necessary root to combat Sybil attacks and provide the appropriate bedrock for dispute resolution, arbitration, and generally interfacing with the real world (as the platform evolves to incorporate more advanced use cases, physical assets, etc.) Once a User ID is created, an Ember is locked to that ID and taken out of circulation.

The specific process of the digital identity creation is designed to provide a personally encrypted and managed data chain of information that allows the user to share as much, or as little information about themselves that they wish. An individual, secure, and immutable record of personal identity. Your on-chain identity is as important as your off-chain identity and in time, will grow to become more so as social networks and e-commerce become increasingly ubiquitous.

Privacy is not about hiding, it is having the ability to reveal yourself on your own terms.
That is why all User information that is collected is stored by each User upon their own data chain, and they can choose to provide access to the information to any requester.

Ultimately, tools such as Driver's Licenses, Social Security numbers, passports and more are arbitrary pieces of identification in which a third party (the government most of the time) vouches for the validity of the information that is provided. Ironically, the information on these forms is generally used to verify the User so that they may gain access to their own information, money, or property. When personally identifiable information is centralized

under one authority, that authority will no doubt become the target of massive data breaches, like the case of the Equifax hack, in which the information of 145.5 million Americans was compromised.

Embermine Entities

There are four Entities on the platform: Creators, Collaborators, Customers, and Projects. Each new User will initially start off by creating the first three, as this is necessary to interact and transact on the platform.

Creators start Projects and begin the process of drafting the Project Compact.

Collaborators are the various Entities who work within a Compact to bring various goods and services to market.

Customers are the Entities which purchase creative assets and participate in the Distributed Patronage system.

Projects are Composite Entities that consist of autonomous Entities bound by common purpose.

Finding the Others

Yet again, we find ourselves at the intersection of analog and digital. As mentioned earlier, the Embermine Platform is an invitation-only environment. Naturally, Creators who have a Project in mind can expend some of the Embers they have accumulated to bring friends and acquaintances, nodes, into the network. This is ideal for Users who want to leverage their existing analog and digital networks (social graph) and bring them onto Embermine to pursue their creative endeavors. Bands are a great example of how an ongoing creative endeavor may transition their operations onto Embermine.

For a creative commerce platform to really accommodate the needs of its users, there needs to be a social component that allows connections to occur between creators and customers. These points of convergence are the moments that contribute to the network's growth. An Entity's record of past collaborations can be made transparent to other Entities, allowing the opportunity for networking and enduring professional relationships.

Contracts in Creative Commerce

Contracts are imbedded throughout all areas of our society. Politics. Finance. Business. In the creative industries, parties of a contract simply want to make sure that agreements are met, usually agreements pertaining to ownership and compensation. Are my intellectual property rights being protected? Am I getting paid according to the agreed upon parameters?

Traditional legally-binding contracts are often written in a byzantine prose that few individuals can fully understand much less those affected by the contract. The drafting and deciphering of these contracts have been the domain of lawyers who have spent years learning the codes and intricacies of their field. The user experience of the parties subject to these contracts is unwieldy and inefficient in light of our current technical capabilities. In a creative commerce platform that intends to eliminate such frictions, relying on contracts with obscure legalese prose can lead to unnecessary ambiguity of responsibility and intent.

Smart contracts are code that execute on the blockchain, directing the movement of value (or assets) in the network. Software that runs on decentralized networks holds a lot of potential in automating a wide range of business logic. Being the operable and programmable side of blockchains, smart contracts will play an important role in applications and platforms built on blockchain infrastructure.

The Compact: Codifying Intent

The Compact is a living document of objectives, settings, and automated agreements (smart contracts). It utilizes Ricardian elements with a simple prose document coupled to it with parameters matching the code, so there is no ambiguity as to the intended purpose of the smart contracts (Grigg, 2015). This helps codify the intent behind a contract. By eliminating the semantic richness and ambiguity of legalese prose, we can maximize the

clarity amongst all the parties to the contracts and the courts of the land. The Compact is essentially a nexus of the programmatic agreements around a common endeavor, detailing ownership and compensation as well as detailing the projects goals.

The Compact is not only a tool to reduce friction between different collaborating pseudonymous personas and the resulting distribution of value, it also provides potential Collaborators the means to scope out the prospect of the project as it is being developed.

Since the end user has no reason to interact with raw code, the parameterization of the smart contract can allow one to change very specific variables within the code using templates. There will be a variety of contract templates catered to certain spheres of creative activity. Over time, creative entrepreneurs will have access to a growing library of contracts each with specific parameters to help fit a wide range of use cases and collaboration scenarios.

Compacts: the combination of operable software and an easily parsable prose contract (intent clause). "What You See Is What You Sign." (WYSIWYS)

By refuting the axiom, "code is law," we can protect the users from possible errors in the underlying software. While smart contracts are deterministic—a given set of inputs will generate a certain output—for security and resiliency of the economic activity taking place we must assume that bugs or errors will occur either within the software or with the participants actions or assumptions themselves ("wetware"). Having the intent clause is a key piece in any meeting of minds. This also builds a nice foundation for arbitration mechanisms for streamlined dispute resolution without resorting to costly and time-consuming litigation. Most courts throughout the land acknowledge arbitration as a valid form of dispute resolution.

The Compact is a stable manifestation of intent that is the machinery of the economic activity around a common endeavor that issues a very specific shape

and size of transaction to the blockchain upon an agreed upon set of conditions defined within it. This creates a channel that can assume consensus because all members agree upon all the explicit terms that define that individual channel's means of creating a valid transaction to the blockchain.

Channels of Consensus

The Compact provides a critical element within its environment: defining the consensus of its operation within the network. In completely open blockchain environments, consensus is maintained with the clever combination of cryptography and economic incentives (crypto-economics). This is necessary to maintain the integrity of the network, and guarantee accuracy of the ledger. Now, that's more of an infrastructural element to blockchains which need to combat adversaries seeking to change the narrative. If the narrative can only be changed upon certain parameters with consensus between certain designated Entities, then you can set up "channels of consensus." The Compact's design does not allow subterfuge because none of the Collaborators can interact with the raw code, only certain parameters that make changes to the code. Changes can only be made with transparency and the positive vote of Entities within the Project. Everyone is incentivized to work quickly on a Project, since the only way it can generate value for the Collaborator is through that Project's completion and release to market.

You can eliminate the bottlenecks of a distributed network if the Entities within certain consensus channels agree on the settings of the machine (the Compact). Is the machine working? Yes. Okay, moving on. The mechanics of this will be explored in a later section introducing the protocol upon which this operates.

Projects as Composite Entities

When Entities work on a Project, there is a "shape" that is formed when these nodes connect. Obviously, if there is an ongoing collaboration between the same Entities, they should be able to reassemble for more Projects. Therefore, Compacts also double as Composite Entities.

This also extrapolates outward in interesting ways considering how partnerships work. A band teaming up with a media production group for a music video is an example of two Composite Entities working together for a Project with its own Compact. As value flows into this new Compact, it will then be redirected automatically to the Compacts of each. Fractal structures.

Tokenizing Creative Works

What happens upon a Project's completion when a good or service is now ready for the market? The efforts need to crystallize into some "thing." In our goal in bridging the best of both worlds—physical and digital—we have determined that utilizing digital bearer certificates in the form of crypto-asset tokens provides the cryptographic certainty and scarcity that can be the pillars of a sustainable creative economy.

By using a scarce object architecture often constrained to the physical realm, we can bring the familiarity of physical possessions into a digital context in a manner that is understood by both the user and the issuer alike (Szabo, 2004), thus allowing many use cases that are made possible at that compromise.

These are not tokenized securities such as Bowie Bonds (Espiner, 2016) that offer future revenue share in exchange for investment, but simply product keys that grant access to specific content.
An economy of scarce objects is not always the ideal model to achieve sustainability, but in the creative economy this design can create value for all participants in the network if implemented appropriately.

Distribution and Market Entry

There are two methods of distribution which roughly correlate to retail and wholesale, but the dynamics are a bit different in the context of scarce digital objects.

One method is to sell creative assets at a retail price. When the Customer purchases the product (a transaction that takes place between them and the Compact, not any one Entity within it), a token is "minted" and put into circulation in the ecosystem. The owner of this newly minted asset can then use it for their own purposes—read, watch, listen, etc.—and later choose to sell or trade it on the open market.

The other method presents a wide variety of options and is made possibly only with scarce digital assets: *rail distribution*.

This approach could be compared to the practice of token "airdrops" on other blockchains, except the utility and purpose of the token is explicitly defined and available immediately upon reception, not *a priori*.

The Compact, using the imbedded Slipstream application, has granular control over asset distribution by designating a rail token (MBRS or otherwise) and applying certain parameters, such as proportioned rates, by which the new asset will be distributed into the ecosystem. This allows a wide range of market strategies. For example, an established writer, Bob, could allow Alice, a debut novelist, to set one of his novels as a rail. This will increase demand for Bob's work as well as provide affective market entry for Alice, especially if they share a target audience. Mutual benefits. Another method is to set rails within one's own body of work, increasing demand. There are many ways creative entrepreneurs can use this to their advantage.

Naturally, the rail system is free for those who receive the assets. So how does this generate value?

Distributed Patronage: A Sustainable Secondary Marketplace Model

The secondary marketplace currently acts like an event horizon in the creative industries. The tenuous connection between a creator and their work is comparable to a black hole absorbing light around an approaching object. Always diminishing, never retaining its brightness and color. This problem is

persistent in both the digital and physical markets. After examining the advantages of each, we have reconstituted a new model designed to incentivize users to participate in the distribution of creative assets post-publication without eliminating the creative team from the equation.

As Users of the Platform accumulate these creative assets through retail sale or rail distribution, they will end up with a sizeable library. Some of these assets they may not want, like romance novels to a science fiction/fantasy reader. The solution here is to turn that excess or unwanted content into value for the owners and the creators of the assets.

The User can set a basket of assets to sell on the open market. A manual approach to this would result in "mental transaction costs" too high for a good user experience. By employing an autonomous agent, an algorithmic trading bot, a user can sell these extra/unwanted assets on an open market to those who didn't partake in the rail distribution or to those who joined the network afterwards. As of now, our algorithmic trading system will be developed by Autonio, who have developed a decentralized AI trading bot for crypto- assets that allows for customization of trading strategies.

Such a "nanomarket" system, complete with scarce objects and autonomous trading, has already been hypothesized in a pre- blockchain context by Nick Szabo (2007). Blockchain simply helped make this vision possible with transactional certainty and digital scarcity.

For the Users of the platform, this can result in a consistent passive income without having to expend much time, energy, or attention.

In order to maximize the value Creators receive from their work, the Compact can designate a secondary market transaction fee, denominated in Ions. Whenever the asset moves from one Entity to another, a small "gas" price must be paid. This creates an ongoing stream of revenue that feeds into the Compact and its constituents. In perpetuity.

This model of distributed patronage provides an effective framework for all participants of the platform to tap into networks of value.

Securing Provenance

All these economic models do not amount to much if Creators' intellectual property are at risk. As mentioned earlier, the Compact has prose elements that can enforce ownership as well as compensation. Ownership is a more benign element compared to compensations since the latter is more operable.

The platform will also utilize a novel form of digital rights management to combat piracy and secure a connection between Creators and their works. Instead of the past applications of DRM that set artificial limitations such as geographical locks and various nonsense, the model we are keen to utilize is inspired by Benji Rogers's notion of "digital rights expression," in which metadata pertaining to a certain creative asset such as ownership is hardcoded into the file itself (Rogers, 2017). This would allow the settings of the Compact to be honored outside of the Embermine ecosystem. This can create many different ways to interact with content: streaming, time locks, interactive media, virtual reality experiences, etc.

Heat: The Thermodynamics of a Creative Commerce Network

While not a token per se, Heat is the metric of social/economic activity around Entities on the network. When a new User joins the network, the total amount of Heat in the ecosystem increases. Every interaction and transaction involves a transference of Heat between Entities. The goal is to create an organic system that is not pay-to-play for signal boosting and presence.

Radiance is the amount of Heat sent into the ecosystem during transfer and over the course of time. This is represented as a percentage, increasing with low activity and decreasing with higher activity. The amount of Heat sent out is absorbed by the ecosystem and other "nearby" Entities, nodes within the proximity of creative commerce activities.

The **HEAT Index** is a number representing an Entity's Heat level relative to similar Entities. A higher Heat Index affects an Entity's visibility throughout

the network, giving it greater presence and signal relative to similar Entities in individual search results, project announcements, and even organic product recommendations.

The goal of Heat is to imbue all the interactions and transactions on the platform with meaning and efficacy and provide a metric of socio-economic activity throughout the network.

Since the Embermine network has a defined purpose in being a creative commerce platform of participating agents with the values expressed in a constitutional document, it makes sense within this context to closely align activity with reputation.

The goal is to diffuse the reputation process throughout the entire network, like the air we breathe. There is no exploitable function or any way to directly "game" the system to increase one's reputation as one cannot directly buy Heat. This eliminates the problem of "whales" exerting a disproportionate amount of influence on the network solely because of their financial stake.

Heat is a component of the Embermine identity system, Ontos, providing the dynamic reputation layer that incentivizes participants to remain active and contribute in a positive manner to the network's growth.

TECHNE

A CONSENSUS PROTOCOL FOR COLLABORATIVE NETWORKS

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The core idea of Embermine, of providing creative individuals the means to automate and streamline their many business relationships without sacrificing their value, was first proposed in a non-blockchain context. We looked to traditional payment processors such as PayPal, Venmo, or Stripe to see if automated payment mechanisms tied to contractual agreements was possible. This was a dead end. A chance encounter with the ideas of blockchain and smart contracts led us to explore those technologies as possible solutions, and eventually we determined that they very well could be.

In the conceptualization and development of Embermine, we have explored many options regarding the choice of blockchain and consensus protocol, from Ethereum, to various permissioned systems, to Graphene 2.0 architecture, EOS, Rootstock, and more. Fundamentally, there were no solutions that were harmoniously aligned with Embermine's purpose, so we have set to develop our own, which extrapolates elements from the platform itself.

An important element to discuss before delving into the consensus protocol is Embermine's network composition and how it deviates from other chains.

By network composition we mean how the participating nodes are assembled and what their roles are (nodes in this context are simply participants). In public chains, anyone can become a participant in the network. There is no trust between nodes since trust is offloaded to the consensus protocol in some crypto-economic schema. A fully open, programmable environment also presents a huge attack surface (as witnessed in Ethereum).

There are *permissioned* (or private) chains in which a sovereign entity uses the blockchain as a secure and resilient data management solution for their operations. In these cases, the nodes are "trusted," meaning that all parties know the identity of any node and can hold them accountable for their actions. There are performance benefits in this arrangement as there are no extraneous elements. These environments don't rely on crypto-economics to maintain consensus as duplicitous action by a bad actor is impossible. However, these operate as "walled gardens" under the watchful eye of some corporate entity(s).

As mentioned earlier, participants within the Embermine Platform are invited into it by members, after which they establish their User ID and create the Entities through which they interact and transact with others in the network. During this process, every member signs the Constitution, so there is a core body of values and rules that reflect the intent behind the network. The network composition here is of pseudonymous agents (with verified identity) who have agreed on the general rules of the game. This is more akin to membership of an exclusive guild.

Earlier in this paper, we detailed the purpose and general design of the Compact and the notion of consensus channels. If every transaction first must be validated by the very construct of its destination, the contracts and settings within the Compact, then *consensus among the parties involved* can be achieved.

This can only work if the value, or settlement layer is detached from the computational, or control layer. The blockchain doesn't need to do everything, it simply needs to be a decentralized ledger of discrete events, a neutral source of truth that persists into the future. If these events must be processed by a construct that checks all of the parameters agreed upon by the parties of the contract and as long as said construct is valid in terms of the Constitution and the operational rules of the network itself, then it can be immediately validated and encoded to the blockchain. There is no crypto-economic incentivization scheme to keep everyone in line since value is created by people participating in commerce.

In short, Techne introduces a means of consensus within the actual economic activity taking place that is not weighed down by extraneous activities. This allows more parallelism with the design of Embermine itself and an alignment of purpose.

Intentional interactions and transactions in specified, unambiguous contexts with consent of all parties involved. This is the goal.

Embermine Ancillary Projects

While the Embermine Platform is the flagship project, there are other projects in development that either have a direct connection to the operations within the Platform and/or a compelling use case in tandem with it.

DomainToken

Originally conceived by experienced domain name broker Ryan Colby as a more liquid, secondary marketplace for domain names, talks with Embermine CEO James Drake eventually resulted in an acquisition and an expansion upon the initial idea. Rather than focusing entirely on the familiar name space of well-established DNS, Domain Token provides a user-managed name assignment application that can allow a User to assign, or "activate," a Domain Token (DOM) to resolve to an existing address in a communication/connection protocol such as DNS, email address, digital wallet, or cloud storage. The linkages between various domains are verified if the intangible asset in question, such as a keypair wallet or a domain, are in fact owned by the individual; for example, only the true owner of XYZ.com can activate a Domain Token for XYZ.com. This application will be readily available to Embermine Entities so they can manage their domain assets for themselves or their projects.

The purpose of this is to give individuals more granular control over their domains across a variety of protocols.

Slipstream

Slipstream consists of two versions: Slipstream Ethereum and Slipstream Techne. The Ethereum version is an application that allows one to distribute a large amount of a specific token to holders of a particular token at proportionate or static rates, within the Ethereum ecosystem. This would be useful for projects seeking to distribute their token through a network of their choice rather than hold a token sale.

This can also be useful for anyone wanting to send many consecutive transactions to a certain list of addresses without manually initiating each transaction. The cost of using the Slipstream Etherum application is denominated in the token, SLIP.

Slipstream Techne is how creatives will be able to distribute their products to market using certain products as a rail. This granular distribution method can be used by projects to more directly reach their target market or renew interest in their previous work. This is how the distributed patronage system operates.

IdeaToken

This project is a forum in which individuals can post ideas, which cost IDEA tokens to participate in the discussion. This is to eliminate spam and provide a metric of activity and interest around certain threads and topics. This is an example of a relatively simple project that uses crypto-asset tokens in a community environment. The idea is that the meeting of minds can produce incredible endeavors and all manner of interesting projects. Books. Movies. Games. Software. Bitcoin was announced and discussed on a cryptography mailing list before launch. While there is no direct connection between Idea Token and Embermine, the former could very well be the site of the discussions that lead to projects on the latter.

TokenVerse

TokenVerse and the TokenVerse Syndication Network are projects intended on creating access points to high quality information and reliable news regarding today's evolving and advancing technologies. Starting with the TokenVerse website itself, visitors are provided with a consistent source of information to both educate and develop their knowledge as they generate informed opinions on the implications of these technologies and their impact upon both our business and personal lives. By vetting and connecting other sources of information, news, and editorial content into a syndication network, streams of consumer or community-defined content can be meshed with feature pieces designed to reach larg-

er audiences. This follows a similar formula of the development of the national television networks. Regional affiliates in these networks use the daily structured ad, news, and entertainment content delivered by the global provider to provide a general foundation while serving their "local" consumers with content and news developed and targeted to them, while contributing it to the whole network as part of the global content stream available to anyone.

Xandria

Xandria is a decentralized knowledge base. This means that there is no central foundation or authority that maintains it. An entry in Xandria begins at a root and branches off as edits or additional content is applied (commits). To add to a particular branch, there is a cost of Knowledge Token (KNOW). Since this is a distributed structure, a version history of revisions is maintained that is censorship-free and available to search.

A Xandria browser plugin has been discussed in which web content across participating
sites can be annotated by users, layering the application over existing sites of information on the web.

Conclusion

The Embermine Platform is an earnest attempt at providing creative individuals the tools by which they can achieve security and sustainability in their endeavors. The origins of the project are directly tied to using other platforms fraught with unnecessary frictions throughout the collaborative process. With a meaningful digital presence, a network of talents and capabilities, automated contracts, scarce digital assets, and a sustainable secondary marketplace, creative entrepreneurs can focus more on their craft and less on the economic machinery.

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