tagion

An Introduction to Tagion

Creating a Sustainable
Economic World

This White Paper is a living document that will be updated as the project develops, and new concepts are being developed.

In other words, the copy you have in front of you is not an expression of the on all the knowledge and development going on right now.

Tagion Whitepaper

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Introduction

In a world where new technologies are transgressing borders, legacy financial systems still chain us to traditional currencies and uniform, yet disparate and incomprehensive, banking models.

As the Internet has already transformed many other industries, a new kind of disruption is now finally confronting the shortcomings of current international pecuniary systems and legacy banking networks, ready to challenge models in the global financial industry that has not changed in decades.

But this time, it is not just the Internet alone.

The new and radically different concepts behind cryptocurrencies and underlying ledger technologies are fuelling a new wave of Fintech that has ushered in a new era for all financial and monetary systems.

These new systems, platforms and protocols are powering the next era of economic infrastructural technology and are poised to bring as much change as the internet did for a plethora of other industries such as newspapers, TV, retail, music, mobility, etc.

However, technical hurdles, governance shortcomings and pricing volatility have been critical roadblocks for these nascent financial instruments from becoming commonplace and have hindered mass adoption in many cases.

This is still the early days. And it's 'Blue Ocean'[1].

Scope

The purpose of this white paper is to provide an overview of the ideas and main features of Tagion. For reasons of context, an overview of the history of the global financial industry is included.

Additionally, a full technical yellow paper is available for an in-depth description of the networks' technical and governance features. This paper provides solutions to problems with the current ecosystem and legacy technology networks which have yet to be addressed in any substantial manner.

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[1] https://www.blueoceanstrategy.com/what-is-blue-ocean-strategy/

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Introducing Tagion

Tagion is a monetary system with revolutionary protocols that has the potential to replace legacy banking systems and trigger a paradigm shift in the current financial ecosystem.

The purpose of Tagion is to create a sustainable economic world. This can only happen with a serious alternative to the current fiat systems (government-issued currencies that are not backed by a physical commodity, such as gold or silver, but rather by the government that issued it).

Tagion is a democratic monetary system with the currency Tagions. It is a complete monetary system that enables essential banking services such as transactions and exchanges.

With its unique governance model, Tagion hands the money power back to the people with a system that is both democratic and socially fair.

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In the current fiat systems (e.g. Euro, US Dollar or Yen) the money is issued and guaranteed by a central authority such as a central bank that controls the system. Essentially this means that a small group of actors manage the given monetary policy - and are in the tempting position of using the system to their own benefit or to the benefit of incumbents.

It is not a new problem:

"The problem with fiat money is that it rewards the minority that can handle money but fools the generation that has worked and saved money"

— Adam Smith, 1723-1790

Today it is not even the state that controls the issuing of money. Instead central banks print more money for commercial banks and the commercial banks leverage the money with fractional banking by creating credits and imposing debts on lenders[2].

Yet, it is the general public that holds the risk with this economic strategy, and it is the public that has to step up when the system comes short of liquidity[3]. A good example of this was the latest worldwide financial crisis. Taxpayers pay for the banks failed attempt of earning huge returns by trying to control the money issuing function in society. It is social injustice - Robin Hood turned up-side down.[4]

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[2] The Federal Reserve is an example of such a central bank.

[3] https://www.irishtimes.com/business/economy/bank-bail-out-estimated-to-have-cost-state-41-7bn-says-comptroller-1.4035332

[4] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010), https://www.jstor.org/stable/j.ctt183h0cz.5

Money should be democratised again and seen as a common resource for all.[5] Tagion will play a substantial role in removing the conflicts of interest in the current financial system and return the money power to the people.

The Tragedy of the Commons is an economic problem in which every individual has an incentive to consume a resource at the expense of every other individual with no way to exclude anyone from consuming. It results in overconsumption, under investment, and ultimately depletion of the resource.

Elinor Ostrom won the Nobel Prize in Economics, for proving an alternative governance model and through this, disproved, the Tragedy of the Commons.

Her solution is called Self-governance of Commons, which she proved is a more efficient way of governing a common resource. Self-governance of Commons needs a governance system in place, where the beautiful part is that the governance is built to serve the users of the resource and to ensure no conflicts of interest between the actors in the system and the owners of the system.[6]

The Tagion governance model is designed and built in adherence to these principles.

With the Tagion system a cryptocurrency, Tagions, is introduced. Tagions are non-collateralised money, meaning that the currency is not pegged to other currencies or assets and thereby fully independent from other monetary systems.

As Tagion is an independent monetary system where Tagions are issued and guaranteed by the Tagion network that is owned by its users. In short, the users of the system are also the owners meaning there is no conflict of interest.

In the Tagion network the authority is decentralised to the nodes that maintain and operate the network by a democratic governance mechanism. The supply of money is constant in the beginning and later in the process, to be taken over by algorithms that uses intrinsic variables as inputs to control the money supply to support a liquid market and trust in the value of Tagions.

Tagion is both owned and controlled by its users and yet, open and technically accessible for everyone. The source-code will be open-source and Tagion as a whole seen as a common good.

In a 1984 interview, Friedrich Hayek famously said:

"I don't believe we shall ever have a good money again before we take the thing out of the hands of government. We can't take it violently out of the hands of government, all we can do is by some sly roundabout way introduce something that they can't stop"

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[5] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010), https://www.jstor.org/stable/j.ctt183h0cz.5
[6] https://www.nobelprize.org/prizes/economic-sciences/2009/ostrom/lecture/

And, in Free Market Monetary System, he noted that:

"...the monopoly of government of issuing money has not only deprived us of good money but has also deprived us of the only process by which we can find out what would be good money. We do not even quite know what exact qualities we want ... because we have never been allowed to experiment with it. We have never been given a chance to find out what the best kind of money would be"

– Friedrich Hayek

It resembles what Bitcoin and other new monetary systems and Tagion strives to solve. Take the money power back to the people who work in the economy and depends on its reliability, making it democratic and socially fair.

We call Tagion the world's first genuine democratic monetary system, due to its governance model. The purpose of Tagion is to create a sustainable economic world.

The impact of a trusted peer-to-peer network like Tagion can have on the financial industry is limitless. Imagine people sending money to each other, exchanging currencies, or trading in financial exchanges across borders lightning fast with nearly no cost and in full privacy. It will increase overall business efficiency to the benefit of all participants in the system. This was one of the primary objectives for early innovators and adaptors of the first decentralised networks.

Banking the unbanked

Globally, 1.7 billion people remain unbanked and excluded from the financial system, making them unable to make digital payments or manage wealth. Tagion is non-discriminating and allows for everyone with internet access to be in a monetary system and have access to all basic financial services.

Remittance market

The average fee per transaction is 7.03%, seen across the globe, according to the World Bank's Remittance Prices Worldwide (RPW), and if the transaction goes through banks, the fee reaches 10.53% on average. - a solid margin that allows room for new players to build lucrative business models.

For providers of digital banking services, Tagion offers a network that removes the expensive dependencies of traditional mainframe-based banking systems and makes it possible to offer cheap, instant, person-to-person digital transfers.

Create a network of online exchanges

Currently, there is a big exchange market for cryptocurrencies. Unfortunately, there is not a better alternative for carrying decentralised exchanges than smart contract technologies, such as atomic swaps. New technologies like DEX, Tagion's decentralised exchange, will catapult this business into a different league.

As Tagion is open source, current exchanges and new players will be able to trade fast, secure and at low fees, while the DEX will allow everyone to make exchanges between supported cryptocurrencies with no middleman.

General use

Tagion provides people with a trusted non-national currency – the money system is owned by the participants.

The extremely low transaction cost enables new business models such as e.g. content subscriptions, where a user would only need to pay per line read in an online article.

Banking would not be fractional anymore, because banks cannot create money anymore, they would need to be fully solvent. It means savings accounts would start to pay interest rates again, as money would have true value based on the backing of the people using the system.

Lending can be facilitated in a borderless economy, and as money is not leveraged anymore, and all the complex regulation that is used to secure the solvency of banks would become irrelevant. In order words, banks would not be able to lend out money they don't have anymore. Even peer-to-peer or peer-to-pool lending becomes a real option as long the credibility and collateral challenges are solved.

Imagine markets without the intervention of central banks, as we have it today, where both stock and state bonds are bought up at large by the central banks, to "support" the market. By which they in reality destroy normal competition and market pricing. Further to this, markets on market terms would mean that bursts and bubbles would be limited.

Money

In order to provide context and fully highlight the issues that Tagion solves, we will start at the very beginning.

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Money was created to solve the problem of the *double coincidence of wants*[7]. Bartering works well when both parties have something the other wants. But when they don't, money removes the need to have the right goods and services to swap. By using money, the need for a double coincidence is eliminated.

In Money and the Mechanism of Exchange (1875)[8], William Stanley Jevons famously analysed money in terms of four functions: a medium of exchange, a common measure of value (or unit of account), a standard of value (or standard of deferred payment), and a store of value. By 1919, Jevons's four functions of money were summarised in the couplet:

"Money's a matter of functions four, a Medium, a Measure, a Standard, a Store"

- Jevons

Though money is thought to pre-date known history (Livestock, are the first and oldest form of money), the first traces of money that appear in our recorded history are from ancient Egyptians (2750–2150 BC) - who measured the value of goods with a central unit called *shat*, which was linked to gold.

In 13th B.C China, Cowrie Shells (the most widely and longest used currency in history) were used as currency and eventually gold and silver replicas of the shells, which led to the first coins.

Salt was also used as currency in human civilisation at times, hence the word *salary,* which derives from the root word *sal*. In ancient Mediterranean cultures, salt was highly valued, and its production was legally restricted in ancient times, so it was historically used as a method of trade and currency. The expression *not worth his salt*[9] stems from the practice of trading slaves for salt in ancient Greece.

Paper money took hold in China in the early 12th century when the government took responsibility for the issuance and management of paper money and coins.

Muslim economists in the 7th–12th centuries brought tremendous innovation to the Dinar currency including the earliest uses of credit, cheques, promissory notes, savings accounts, transactional accounts, loaning, trusts, exchange rates, the transfer of credit and debt, and banking institutions for loans and deposits.

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[7] https://www.economicshelp.org/blog/glossary/double-coincidence-wants/
[8] https://www.amazon.co.uk/Mechanism-Exchange-William-Stanley-Jevons/dp/1514369745
[9] https://www.phrases.org.uk/bulletin_board/17/messages/514.html

Europeans did not see paper currency until the 17th century when paper money was first introduced in Sweden in 1661. And on March 10, 1862, the first United States paper money was issued.

However, seeing that paper money has no intrinsic value, there was nothing to stop issuing authorities from printing more of it than they had gold or specie[10] to back it with. And because it increased the money supply, it increased inflationary pressures.

Hence, by 1900, most of the industrialized nations were on some form of gold standard, with paper notes and silver coins constituting the circulating medium.

Today there are none. Fiat (Latin for *Let It Be Done*) currencies[11] are the global standard. Today we live in the age of enforceable legal tender meaning the refusal of "legal tender" money in favour of some other form of payment is illegal.

A lot of criticism has been given on that fiat money does not have any intrinsic value, but that argument is an historic one, based on the history of gold and silver, and leads to the argument that scarcity is good - often accomplished with gold or silver.

This is a false reasoning, e.g. gold coins' value is not the value of the commodity of gold, but the value of what the gold money represents, which becomes clear over time. Perhaps the gold keeps its intrinsic commodity value, but it cannot be used to buy anything in the future. The same goes for money backed by gold, the commodity gold can be valued on its own, but cannot secure the value or act as a unit of measure of the currency, because the currency represent all goods, not only the commodity of gold.

Money backed by or consisting of scarce resources can - on the opposite - slow an economy because of scarcity of money, where the money is bound to a commodity when it should represent all goods.[12]

Money is not intrinsic in itself, but it merely measures the relative value of all the products and services it represents. Money should be seen as a social phenomenon.

"Sound money' is a product of society, not of nature"[13]

- Hutchinson

Money is something people must trust, can be honoured in trade and maintain its value - while its actual value can vary over time. One should look at it as a trust in the system or trust in the authority behind the system.[14]

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[10] https://www.encyclopedia.com/social-sciences-and-law/economics-business-and-labor/economics-terms-and-concepts/specie
[11] https://en.wikipedia.org/wiki/Fiat_money
[12] Davies 2002:646
[13] Hutchinson et al., 2002:211
[14] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010), https://www.jstor.org/stable/j.ctt183h0cz.5

Money qualities or properties are of much importance independent of which stand you may have: Money should be readily transferable, globally acceptable and a store of value[15].

Moreover, we think, and others as well, that money should be non-political meaning and that money should have the same value no matter who owns them and what they have been spent on.

Transactions should be non-traceable and money anonymous. Otherwise, they can be used politically and for discrimination not allowing global adoption and freedom for the user.

In 1983, the first seeds of a new era were sewn. The American cryptographer David Chaum[16] conceived the first centralised, anonymous, cryptocurrency called ecash[17], followed by DigiCash[18] in 1990. But things really took a massive turn when in 2008 decentralised cryptocurrency was born. Released as open-source software in 2009 by Satoshi Nakamoto, Bitcoin entered the fray.

And things began to change.

Ledgers, Banking and Money – History and Overview

The ledger has played an integral part of human civilisation since the Sumerian civilisation invented writing some 5000 years ago in order to document trade and record quantities in 'stone ledgers' within their culture. Another way to look at it is - the ancient Mesopotamians invented Microsoft Excel before Microsoft Word. Being able to record data outside beyond the memory of humans was a huge step to making their system more efficient and less prone to error. In essence, the ledger drove humans to create the first written language.

The next innovation in the evolution of the ledger - double-entry bookkeeping (the recording of both debits and credits) - was mentioned by the Romans in 70 AD and in the Jewish community of the early-medieval Middle East, in Egypt in the 11th century.

However, the Italian mathematician Fra Luca Bartolomeo de Pacioli, who worked with Leonardo da Vinci, first codified the system in his mathematics textbook *Summa de arithmetica, geometria, proportioni et proportionalità[19]* published in Venice in 1494. De Pacioli's work allowed the Medici banking dynasty to establish the first merchant bank and sow the seeds of the global banking system simply by recognising the importance of the ledger by intermediating between savers and borrowers for a fee. By creating a central ledger which kept track of all debts and

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[15] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010),
https://www.jstor.org/stable/j.ctt183h0cz.5
[16] https://en.wikipedia.org/wiki/David_Chaum
[17] https://en.wikipedia.org/wiki/Ecash
[18] https://en.wikipedia.org/wiki/DigiCash
[19] https://en.wikipedia.org/wiki/Summa_de_arithmetica

claims, the Medici's created a powerful centralised system of trust. With the help of their specialised intermediating services, strangers that previously had no way of trusting each other to do business could now do so.

This was followed by a number of important banking innovations that took place in Amsterdam during the Dutch Republic in the 17th century, and in London since the 18th century. During the 20th century, developments in telecommunications and computing caused major changes to banks' operations and let banks dramatically increase in size and geographic spread.

Even now in the 21st century, all conventional legacy financial systems use the same cornerstone – the central ledger. Every financial transfer is (typically) registered in such a ledger, and once recorded, it is set in stone, like the Sumerian proto-cuneiform clay tablets that recorded numbers for the ancient central administrators to manage.

Central Banking

"Let me issue and control a nation's money and I care not who makes the laws"

- Mayer Amschel Rothschild

The Bank of Amsterdam established in 1609, was the precursor to, if not the first, modern central bank. The roots of the bank began with goldsmiths. The Dutch would hold their gold with goldsmiths in return for an official note. However, the goldsmiths realised that customers were not cashing in all their notes at the same time, and they saw the opportunity to invest their coin reserves in interest-bearing loans and bills. Gold keepers were suddenly transformed into interest-paying and interest-earning banks.

This gave root to not only the Bank of Amsterdam but also what is now known as fractional reserve banking today. The problems began when gold holders lost faith in the ability of a bank to return their gold for notes and the *bank run*[20] was born - killing off many early banks and giving rise to the central banking system.

The official title of the world's first central bank goes to the Swedish Riksbank, which was created in 1668. Many other countries soon followed and kicked off their central banks by the end of the 17th century.

These new central banks were given the legal power to create monetary policy. By controlling and storing the gold from banks in the nation, central banks were therefore able to save banks by moving gold around to ensure bank runs would not create insolvency.

We are talking about institutions that not only manage the currency, money supply, and interest rates of a state or formal monetary union, they also oversee the

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[20] https://en.wikipedia.org/wiki/Bank_run

commercial banking system and have a total monopoly on increasing the monetary base in the state and control the printing of national currencies.

Global Reserve Currency

Due to the Bretton Woods Agreement in 1944[21], the US dollar was officially crowned *the* global reserve currency, backed by the world's largest gold reserves - which were boosted by heavy gold payments from European countries to the US in WWII.

So instead of gold reserves, other countries built up reserves of U.S. dollars. Countries began buying U.S. Treasury securities, which they considered to be a safe store of money.

Today, more than 61% of all foreign bank reserves are denominated in U.S. dollars, and nearly 40% of the world's debt is in dollars.

However, winds have shifted. In 2019, Canadian Mark Carney, governor of the Bank of England, suggested replacing the US dollar as the world's reserve currency with global cryptocurrency tied to a *Synthetic Hegemonic Currency (SMC)* - or a multi-currency backed cryptocurrency[22].

"Even if the initial variants of the idea prove wanting, the concept is intriguing"

– Mark Carney

In order to try and avoid a global financial meltdown, Carney also suggested another solution could be to make the IMF's SDR[23] also a reserve currency backed by *a basket of currencies* specifically saying that could be a first step to reorder the world's financial system.

The time is ripe. It's clear that change is coming. And change needs to come. The system is flawed. Everyone knows this.

China, the USA and Europe are head to head in battle to rule the global financial industry in the 21st century. It's a money war.

From credit to debt based financial system

The word credit comes from Latin *credere,* to believe. The holder of money believes it has value and the receiver in a transaction believes it has value. From a society point of view credit to the holder is a debt on society. However, today to give credit means taking on debt. Debt comes from Latin *debere*, to owe. This change is quite confusing and does not make sense, but that is how the system has evolved. [24]

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[21] https://www.thebalance.com/bretton-woods-system-and-1944-agreement-3306133
[22] https://www.the-blockchain.com/2019/08/28/canadian-bank-of-england-governor-mark-carney-calls-for-a-global-monetary-system-to-replace-the-dollar/
[23] https://www.imf.org/en/About/Factsheets/Sheets/2016/08/01/14/51/Special-Drawing-Right-SDR
[24] Mellor, Mary

The issuing of money was earlier a mixture of state money and commercial debt-money in banks. State money is freely printed and has no debt tied to it, but today the majority of all new money is created in commercial banks out of thin air and thus the confusion[25].

"The process by which banks create money is so simple that the mind is repelled. Where something so important is involved, a deeper mystery seems only decent"

- Galbraith, 1975:18-19

It means the capitalist system, the financial industry controls the money creation and enjoys all the benefits of controlling the money system in society, but when a crisis hit the commercial banks need the state, the taxpayers to pay for their risks and high profits. It raises the question of democratic control of one of the biggest powers in society and social justice[26].

Incumbents control the current systems, leading to a lack of competition, innovation and continued incompatibility between systems. JPMorgan made a record profit in 2018, posting net income of $32.5 billion and an astonishing $111.5 billion in sales. They move[27] more than $6 trillion on a daily basis[28] - in country crossing wire transfers that take days and customers pay exorbitant fees upwards of 7% on average.

The prevailing thought seems to be "If it isn't broken, why fix it?"

But is it *not broken?*

[25] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010),
https://www.jstor.org/stable/j.ctt183h0cz.5
[26] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010),
https://www.jstor.org/stable/j.ctt183h0cz.5
[27] https://www.businessinsider.nl/trump-tax-cuts-37-billion-jpmorgan-profits-2019-4/
[28] https://www.cnbc.com/2019/02/13/jp-morgan-is-rolling-out-the-first-us-bank-backed-cryptocurrency-to-transform-payments--.html?&qsearchterm=jp%20morgan%20blockchain

Society: Is It Broken?

In fact, the global financial industry is broken as the Bretton Woods system is not working anymore, there is no global currency and each state has its own fiat.

Major fiat currencies as e.g. Euro[29] [30], Renminbi Yuan[31] [32], and US Dollar[33] [34] have expanded their money supply heavily since the financial crisis, and after the dotcom bubble in 2000. Globally lowered interest rates are heading for zero and even going negative. For example, the Euro interest rate is currently at -0,5%. This is done to stimulate the economy and overcome liquidity shortage but it's not leaving much room left to take on another recession, because the interest rates are already very low, and the money supply is increasing rapidly today already.

The real question is: Are these systems sustainable in the long run?

The concurrent debt-based fractional banking system, where the privately-owned, centralised commercial banks control the money supply should be taken very seriously, because this is *exactly* what caused the 2008 financial crisis.

These private interests can create money out of thin air, and they create huge profits out of nothing by creating debt that society, will, in the end, have to pay.[35]

However, to digress, we have seen that commercial banks are essentially *un-trustable* trust agents. Just look at the 1997 Asian Financial Crisis, the 2001 Dotcom Bubble and the 2008 Subprime Mortgage Crisis which directly led to the 2010 European Sovereign Debt Crisis and caused a cataclysmic global financial meltdown.

Yet the bankers still collected their massive bonuses[36], financed by government bailouts and the misaligned incentives to cheat and lie on Wall Street[37] remain in place. The hands-off market policies of many governments, under the guise of *deregulation,* really means *free to profiteer[38]*.

Does it not make sense to build new systems that encourage and reward good behaviour rather than keep old systems that do the opposite?

This leads us to the current situation, where we have a debt based and fractional banking system, where debt and money printing are valid arguments to *save* an economy or *create* growth.

The global financial system is clearly broken with the money power even more centralised by digitalisation. Fractional banking is in the hands of private banks who gamble with our money, while not taking the risk themselves as they can always be

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[29] https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html
[30] https://fred.stlouisfed.org/series/MYAGM2EZM196N
[31] https://en.wikipedia.org/wiki/Money_supply#/media/File:China_M2_money_supply_vs_USA_money_supply.png
https://www.global-rates.com/interest-rates/central-banks/central-bank-china/pbc-interest-rate.aspx
[32] https://en.wikipedia.org/wiki/Money_supply#/media/File:China_M2_money_supply_vs_USA_money_supply.png
[33] https://www.federalreserve.gov/monetarypolicy/openmarket.htm
[34] https://upload.wikimedia.org/wikipedia/commons/9/9f/CPI_vs_M2_money_supply_increases.png
[35] Mellor, Mary
[36] https://www.nytimes.com/2009/07/31/business/31pay.html
[37] https://issuu.com/capitalinstitute/docs/act_ii_final_19816282908d30?e=33301005/67795021
[38] https://en.wikipedia.org/wiki/Profiteering_(business)

saved by the guarantee of taxpayer's bailout money from governments *'saving the economy'*.

One could argue that control of money should completely go back into the hands of the State, but the State also has a selfish and twisted interest in the system to finance its own welfare, wars, weapons, growth, etc.

Karl Marx theorised over this with his Commodity-Money-Commodity (C-M-C) thesis, where one produces a good, then sells it for money to buy another commodity[39]. The production focus on the utility value of the product, where the purpose of money is to buy a product with utility one needs is the end goal. If the relation is Money-Commodity-Money (M-C-M), at this point the end goal is mean, which has no intrinsic value in itself. Here labour loses control over what they produce, and the capitalists control the system.

Today, it's not just the capitalist banking system that is the problem, but also the state, which has a history of subsidising and intervening in markets such as the stock market or housing market, subsidising industries that screw competition and destroy innovation.

Marx also stated that money does not have any function and only reflects the value of the goods it represents.

That is not the case, because it is clear that a dysfunctional money system halts or destroys the real economy and creates problems such as financial crises.[40] There needs to be enough money in circulation to support the markets demand and supply, otherwise markets freeze and all exchange of goods stops.

We need to question the issuing, circulation of money and the ownership and control of the money systems.[41] We clearly need to invent new systems for the pecuniary needs of a future society and create a fairer, just world.

"I would remind you…that Socrates was executed not for saying what things were or should be, but for seeking practical indications of where some reasonable approximation of truth might be. He was executed not for his megalomania or grandiose propositions or certitudes, but for stubbornly doubting the absolute truths of others"

- John Ralston Saul.

This is truly a massive societal challenge - on a global level - and while it's easy to believe that massive change is not possible, if we look at other industries creative destruction has been the ignition for transformation.

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[39] https://www.investopedia.com/terms/k/karl-marx.asp
[40] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010), https://www.jstor.org/stable/j.ctt183h0cz.5
[41] Mellor, Mary; The Future of Money; What is Money? Pluto Press (2010), https://www.jstor.org/stable/j.ctt183h0cz.5

tagion

"At the heart of capitalism is creative destruction"

- Joseph A. Schumpeter

We need a system free of the interest of the state and we need to create a new market that is seen and governed as a common resource with no built-in conflicts of interest.

Therefore, we need a monetary system that will be seen as a common resource for all its users, controlled and owned by the users.

The money issuance should not be bound to scarce resources as it creates lack of liquidity stopping markets to function. Still, too much money could also be a problem creating bubbles. However, in the case of money overload in a user-owned system, at least it belongs to the users themselves and not a banking system.

Moving Money

The average international bank transfer takes three days to settle – this has a lot to do with the current financial infrastructures. If you want to send money from a UnicaCredit Banca account in Italy to a Wells Fargo account in the U.S., the transfer executes through SWIFT[42], which sends 24 million messages a day (277 messages/sec) for 10,000 financial institutions[43].

Intermediaries such as card providers and payment services make it easy to use money digitally daily but also take a notable cut for their services. This cut inevitably becomes an added expense to the end user and puts pressure on the mark-ups of retailers and merchants.

And today, we are forced to deal with banks with fiat currency and few other institutions hold the purse-strings like banks do in the global economy.

Or are we?

"Banking is necessary, banks are not"

- Bill Gates, 1990s

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[42] Society for Worldwide Interbank Financial Communication
[43] https://medium.com/official-rate3/business-update-1-how-blockchain-could-disrupt-financial-service-s-and-what-rate3-aims-to-a5eb2050d38

Distributed Ledger Technology

The underlying technology for Bitcoin, called Blockchain or Distributed Ledger Technology (DLT), is a technology that allows for a ledger to be stored in a database which is distributed among multiple nodes, either in a public or a private network.

By contrast, most banks use a centralised ledger, private to each bank, in each bank's own set of databases.

At present, when money is moved from one bank to another via a bank's counterparty network, both banks, and many times, several intermediaries, need to reconcile their records and update each of their individual ledgers.

DLT eliminates the need for an intermediary or central authority when transactions are processed. Instead, DLT handles issues such as double-spend, reconciliation and transfers by use of cryptographic proof and consensus algorithms that are executed on the nodes hosting and serving the ledger database.

Bitcoin and Ethereum and a number of other blockchain networks are good examples of DLT. However, they have yet to gain significant uptake for everyday use, as they suffer from a number of shortcomings, ranging from lack of processing speed, scarce support for a very low number of concurrent transactions, broken governance models, energy costly consensus mechanisms and, for the related cryptocurrencies, price fluctuation and lack of mature exchange markets.

Bankers are watching and engaging

Even big banking is starting to realise the impact that decentralised ledgers and blockchain are going to have to the current banking mechanisms and that these emerging technologies are likely to fuel a major systemic change for banking as we have known it for the past 700 years.

Look at the JPM Coin[44] (announced in February 2019) from JP Morgan Chase. It's the second dollar-backed cryptocurrency (stablecoin) from a major bank (the first was Signet, launched by Signature Bank on December 4, 2018). It was announced by as an institution-to-institution service. JPM Coin is a permissioned blockchain variant of Ethereum called Quorum which is used as the distributed ledger platform. R3[45] (founded in 2014) has had an impact on the global financial system as an international blockchain banking consortium. It has an ecosystem of more than 300 firms building distributed apps on top of blockchain protocol Corda for industries such as financial services, insurance, healthcare, trade finance, and digital assets.

But will change come and how fast? We no longer need the Medici-like trust agents keeping tabs in the middle. Creator of Bitcoin Satoshi Nakamoto, using game theory, mathematics, psychology, sociology, economics and cryptography gave us

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[44] https://www.jpmorgan.com/global/news/digital-coin-payments
[45] https://www.r3.com/

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a solution for the Byzantine Generals problem[46] and created a distributed ledger within a thrustless system, and cut the bankers out of transaction cost economics.

Bitcoin is a serious technological discovery that has put the global financial industry on alert. As the first distributed system simultaneously able to tolerate pure permissionless consensus in the presence of up to 50% Byzantine faults[47], DoS resistant[48], Sybil resistant[49], and use incentives to encourage honest participation (Proof of Work[50]), it has supplied the world an elegant and simple way to utilise a decentralised and truly permissionless distributed system to disrupt the status quo in the global financial industry.

But Bitcoin is not the end game. It was just the start.

Though it has been highly successful, there are problems. Ironically centralisation is one of them. Bitcoin was supposed to be decentralised, but it didn't end up this way. And never will. On top of that, Proof-of-Work is an environmental nightmare[51]. The carbon footprint of Bitcoin mining is comparable to the entire carbon footprint of the country of Denmark.[52]

Problems with Bitcoin and Centralisation

1. Less than 1000 people own half the market cap of Bitcoin, a centralisation of wealth that far surpasses any other currency and country - even North Korea. A Gini coefficient of 1.0 means that a single person controls 100% of a country's income/wealth, North Korea scores 0.86 and bitcoin scores 0.88[53].
2. A small group of companies – mostly located in Russia, Georgia and China – control between two-thirds and three-quarters of all crypto-mining activity[54].
3. Almost all Bitcoin transactions occur on centralised exchanges that are hacked on a regular basis[55]. Over the last 10 years, it's estimated that more than 1 million BTC, has been pilfered from exchanges[56]. That's about $10 billion.
4. The development and future of Bitcoin is controlled by a foundation board and a small group of core developers who, it seems, are at battle with - and under pressure from mining pools[57].

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[46] https://en.wikipedia.org/wiki/Byzantine_fault
[47] https://en.wikipedia.org/wiki/Byzantine_fault
[48] https://en.bitcoin.it/wiki/Weaknesses#Denial_of_Service_.28DoS.29_attacks
[49] https://en.wikipedia.org/wiki/Sybil_attack
[50] https://en.wikipedia.org/wiki/Proof_of_work
[51] https://thriveglobal.com/stories/bitcoin-is-an-environmental-nightmare/
[52] https://digiconomist.net/bitcoin-energy-consumption
[53] https://www.theguardian.com/technology/2018/oct/15/blockchain-democracy-decentralisation-bitcoin-price-cryptocurrencies
[54] https://www.theguardian.com/technology/2018/oct/15/blockchain-democracy-decentralisation-bitcoin-price-cryptocurrencies
[55] https://hackernoon.com/a-huge-list-of-cryptocurrency-thefts-16d6bf246389
[56] https://news.bitcoin.com/hackers-have-looted-more-bitcoin-than-satoshis-entire-stash/
[57] https://bitcointalk.org/index.php?topic=2255631.msg22880044#msg22880044

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Tagion

The team behind Tagion has spent significant time and money on building a system that addresses many of the issues that both the fiat based monetary system and DLT based systems are suffering from. Tagion is both an alternative - and a supplement - to both the current system and the DLT based systems.

The Tagion models are in place and a lot of the supporting technology has been built and is running in a demo network. The maturity of the system is high, which is why a launch of a full functional test network is to be expected within the next few months. The code will eventually be open-sourced, but for now it is closed source. Access to the code can be granted based on legitimate interest. Parts of the IP have patents pending. These parts are described in some detail in the Tagion Technical Paper.

What exact problems and how these are addressed by the Tagion system is discussed in the following. Three main topics are addressed, which are:

- Governance
- Decentralised Exchange (DEX)
- The underpinning technology

Tagion Governance

The governance model is a set of rules that define how decisions on different levels are made and adopted. A well-designed governance model is one that represents the interests of all actors in the network.
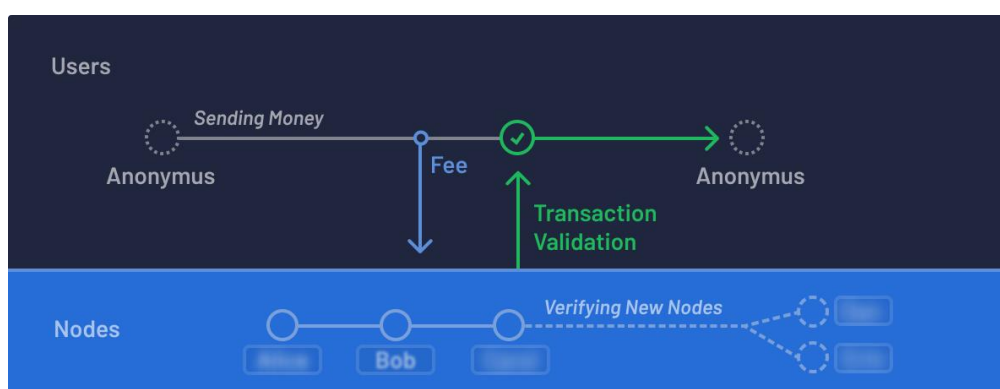
The system consists of users and nodes. Nodes run the software that is used for maintaining the Tagion ledger and are paid for providing these services. A node is owned by a user that has opted to become a node owner. Users pay to use the network that is making the transactions. Both users and node owners need to have their interests represented and balanced for the network to function.

The common problem in DLT governance is the centralisation of power, like in the case of Bitcoin[58] and Ethereum[59]. Proof-of-work and proof-of-stake are giving the power to the actors having most power, either monetary or computational power. It is neither democratic nor decentralised, as it by design facilitates centralisation, because of the needed financial resources and competencies to compete as a miner in the network. A more democratic governance model is needed, which also ensures healthy development, incentivises and secures the decentralised system.

Effective decentralisation is crucial to keep a network secure, borderless, censorship-resistant and self-governed. In the case of Tagion, it means that the system needs to be controlled by node owners, in an efficient and democratic manner. The Tagion governance model is based on ideas and design principles of Nobel prize winner, Elinor Ostrom who solved the Tragedy of the Commons[60] and on Charles Darwin's evolutionary theory[61] of how species best survive in a new environment.

Ostrom summarised the conditions needed to solve the Tragedy of the Commons[62] with eight core design principles for which she was awarded the Nobel Prize in economics in 2009:

1.   Clearly defined boundaries

2.   Proportional equivalence between benefits and costs

3.   Collective choice arrangements

4.   Monitoring

5.   Graduated sanctions

6.   Fast and fair conflict resolution

7.   Local autonomy

8.   Appropriate relations with other tiers of rule-making authority (polycentric governance).

The governance mechanism in Tagion implements all of Ostrom's core design principles.

Public and Permissionless

The Tagion network is public, permissionless and has no central authority, meaning it is technically impossible to limit someone from using the network. Anyone can take part with the only prerequisite being internet access.

Roles and Incentives

The business model is that the user pay a fee for services on the network and node owners get rewarded for operating the network.

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[58] https://www.blockchain.com/en/pools
[59] https://www.etherchain.org/charts/topMiners
[60] https://evonomics.com/tragedy-of-the-commons-elinor-ostrom/
[61] https://en.wikipedia.org/wiki/Darwinism
[62] https://wle.cgiar.org/content/elinor-ostrom-%E2%80%9Cnon-tragedy-commons%E2%80%9D

Users benefit from fast, private, cheap and uncensored transactions, while nodes benefit from the incentives offered to them for operating the network.

Node owners are public servants of the network and are identifiable through a name record in the system, where they have a pseudonym. Node owners must be socially validated to participate, this validation is performed by other node owners. A node owner gets rewards from fees and from validating other node owners and are thus rewarded for keeping the network healthy.

The network, its technology and protocols need to evolve continuously to keep both users and node owners incentivised, and to ensure upon the systems overall efficiency and security. The Tagion governance model is divided into three separate governance layers, allowing this to happen:

- Node Governance
- Economic Governance
- System Upgrade Governance

Technical details about the governance model can be found in the Tagion Technical Paper, available from https://tagion.org/tagiontechpaper.pdf.

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Node Governance

The Node governance layer is the security mechanism in the Tagion network. It limits the chance and the rate at which bad actors can join the network and ensures a fair distribution of rewards.
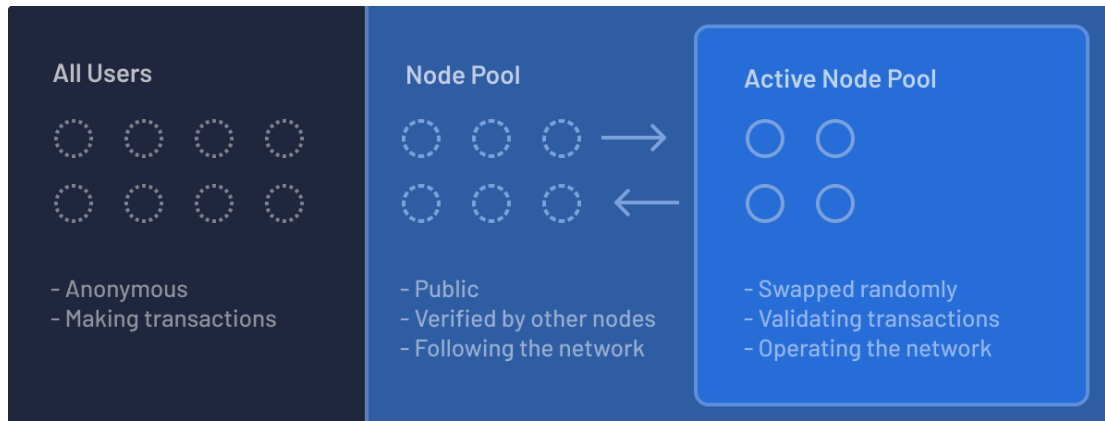
Nodes in the Active Node Pool operate the network. Nodes are swapped in and out of the Active Node Pool by an unpredictable random algorithm, making it impossible to predict how a current or future Active Node Pool is made up.

Proof-of-People

Tagion utilises what is dubbed the Proof-of-People protocol, a heuristic social protocol based on random validation and social components, to achieve a democratic principle of "one person – one node" and "one person – one vote". The social component makes it difficult to operate more than one node, while the scoring mechanism reduces the incentive of doing so even more.

Any user can apply to become a node, by following the seven main steps:

1. A user creates a name record in the system to become a public user.
2. When the name record is at least a month old the user makes a node transaction and pays a fee to become a node. The user then participates in the lottery for becoming a node. All participating users will eventually win the lottery.
3. When the user has won the lottery, the user proves to the network that activity has taken place during the past seven days. By doing this, the user also accepts to become a prospect node. The next step is for two current nodes in the system to mate and give the new user - now their offspring - a gene.
4. The prospect engages in a dialogue with three randomly chosen nodes. The three nodes need to socially validate that the prospect is an actual person.
5. The prospect nodes follow the network and earn node reward points until the minimum score is obtained.
6. The prospect engages in a dialogue with two randomly chosen nodes. They should all socially validate the prospect is an actual person.

7. The prospect is now a real node, is given a birth date and an updated gene string in the system and can become an active node.

Each step is designed with a specific function in mind.

The first to steps create an incentive for the user to become a node (public name and recovery of the paid (stacked) fee). The one-month age requirement for the name record introduces a time-lag in the system making it impossible to spin up a lot of nodes overnight. The lottery makes it random in which order new nodes are chosen again avoiding a person to spin up a large number of nodes in a short period of time. This virtually eliminates Sybil Attacks[63].

Step 3 ensures that the user is an active participant on the network and not just an inactive lottery ticket. Two nodes verify the node and gives the user a gene by making a mating transaction.

Step 4 is another security check that ensures the prospect node is a real person. All nodes have a name record making it possible to contact each other and engage in a dialogue either by video or chat.

Step 5 is another time-lag, but also a test of commitment. At this stage the node can follow the network and in practice operate the network.

Step 6 is again a second social validation through dialogue.

In step 7 the prospect has become a node and given a birth date and a gene in the system.

Reputational Scoring Model

The Reputational Scoring Model is based on Charles Darwin's evolutionary theory of how species best survive in new environments.

One of Darwin's best-known statements, 'survival of the fittest', is that all species of organisms arise and develop through the natural selection of small, inherited variations that increase the individual's ability to compete, survive, and reproduce.[64]

Another important, but less famous aspect of Darwin's studies is the 'survival of the kindest'. Darwin argued for "the greater strength of the social or maternal instincts than that of any other instinct or motive." His reasoning was disarmingly intuitive; in our hominid predecessors, communities of more sympathetic individuals were more successful in raising healthier offspring to the age of viability and reproduction -- the *sine qua non* of evolution.[65]

Both gene-diversification and caretaking are the inspiration for the scoring model variables described below.

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[63] https://en.wikipedia.org/wiki/Sybil_attack
[64] https://en.wikipedia.org/wiki/Darwinism
[65] https://www.psychologytoday.com/us/blog/born-be-good/200902/darwins-touch-survival-the-kindest

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A node in the system has multiple reputation scores that determine its chance to earn rewards:

- The **Gene Score** improves when node mates with each other (validates), and by that perform a human-work aspect of running the node, which improves the genes. That is both gene-diversification and caretaking of the network, keeping it healthy, giving it a better node score and improving the likelihood of being chosen as an active node.
- **Contribution Loyalty** increases when the node operates the network and decreases, when not available.
- **Active time** increases when the node operates the network and decreases the chance of being an active node.
- **Node age** increases along with the node being available for the network and so does the chance of being swapped into the active node pool and receive rewards.

The active nodes earn the rewards in the system and the model controls who are active nodes. The scores determine the probability of being swapped in and out as an active node. Therefore, the model creates an incentive for being available for the network and increase node age and improve the gene scores continuously.

The node governance, Proof-of-people and the reputational scoring model are the primary governance mechanisms for securing the network. When combined, it becomes very difficult to attempt a network take-over, as it would require a lot of resources, patience and a lot of consideration towards how to ensure gene diversity.

E.g. an evil actor wants to take control of the network that consists of 10,000 nodes and 100 active nodes.

In this case the probability for the 100 evil nodes to take over the network is in practice zero, as most existing nodes would have higher availability scores now and going forward and better gene-scores. The evil actor would in other words, need to spin up just as many evil nodes as there are available nodes in the entire network … and ensure their scores outmatch that of all the other nodes.

It would be close to impossible, as the proof-of-people protocol is invoked both when becoming a node and for an on-going dialogue going forward. In the beginning it can be argued that the lower numbers of nodes make it easier to attempt a takeover, but as adoption occurs, it becomes very impossible.

The mathematical proof for the claim is detailed in the Tagion Technical Paper.

Economic Governance

It is crucial both for trust and efficiency of a monetary system to regulate the money supply efficiently. Central banks do it for fiat systems and many DLTs, such as Bitcoin, have a fixed money supply designed after scarce resource model theory[66].

Others choose to peg their currency to fiat currencies or assets by creating some kind of a collateral as guarantee, which makes the system depended on others and not a "real" independent monetary system. Pegged currencies are known as stable coins and are currently being considered as potential securities by the us regulators (the SEC).

Tagion will be an independent monetary system with no centralised group of people controlling the money supply. Furthermore, a fixed supply is not efficient for making the market liquid, as the exchange unit is scarce, and it may not be able to cope with the market demand.

In Tagion algorithms function as money supply oracles that control the supply, based on internal variables.

Rewards and fees are also controlled by algorithms that help make up the mechanism for regulating the money supply in the network.

Economic governance will be implemented in two phases in the network. In the first phase token supply will be linear and stable and have a hard cap. The second phase introduces a model for stabilising the currency based on internal variables in the network that controls the token supply.

Tagion will be a non-collateralised currency, meaning not pegged to any other currency or assets, keeping it as an independent monetary system.

Phase 1. Stable and fixed supply

In the first phase - as Tagion gains adoption - there will be a stable and known money supply, like Bitcoin. This will last for a maximum of five years or until phase 2 commences.

Price volatility is expected at first, since mass adoption does not happen immediately.

As adoption increases, along with the number of actors in the system, a single actor's transaction will become insignificant to the price, which helps price volatility to decrease. When the network is ripe, Phase 2 will be started, where algorithms will control the money supply and stabilise Tagions.

Phase 2. Algorithm controls the money supply

This is a concept on how the money issuing and burning should be controlled. It goes between two extremes of a currency backed by a scarce resource, limiting the

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[66] https://nakamotoinstitute.org/static/docs/commodity-and-scarcity-in-light-of-bitcoin.pdf

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supply which decreases the liquidity and general economic activity. The other extreme is unlimited supply, where a significant amount of money is printed and added in the system all the time, and by that destroying the measurement function of the currency.

Most importantly, money is a social phenomenon based on trust in it having future value and being acceptable as payment. Hence a money issuing function is needed that can gain trust by users over time. Trust cannot be gained, if such a function is overly complex and non-transparent or if it relies on external variables from other systems.

In general, to keep the market stable, a simple modelling of the use of money must be based on internal variables, such as velocity of money (total velocity of Tagions), adoption level, supply of money, average transaction sizes and more. The model can be used as a measure for demand on liquidity and be the basis for whether money needs to be added or removed (burned), to keep the market stable.

The system burns money every time a transaction is made, and all fees are burned per definition. Rewards are given to nodes, when consensus is reached. If the rewards sum up to more than the burned fees, there is a money increase in the system, and the sum is lower than the burned fees, the opposite is true, i.e. a money decrease.

System Upgrade Governance

Algorithms are controlling upgrades of network protocols and script functions. The aim is to foster collaboration and avoid hard forks.

The system upgrade governance consists of three sub-layers:

Minor upgrades and bug fixes are adopted at a higher rate, as compatibility is maintained with current protocols.

The core and structural upgrades require nodes to operate both the new and old version of the network in parallel, until the majority of the network adopts the change.

Script function upgrades need to be approved by five out of six nodes to take effect. Script function upgrades does not impact the network protocol.

Governance Conclusion

The Tagion governance model addresses all the known issues of modern cryptocurrency, while at the same time serving as a security mechanism, completely disincentivising malicious behaviour. It is truly decentralised and represents the interests of all its users and node owners alike.

Decentralised Exchange, DEX, a cryptocurrency market innovation

Tagion solves many of the issues found in other major cryptocurrency networks – which opens the door for the creation of more effective decentralised exchanges between cryptocurrencies.

Currently, many centralised cryptocurrency exchanges offer similar exchange services such as Bitcoin to USD exchange. There is however no interexchange market between these institutions and platforms, which means that a price difference is often to be found on the same currency pair offers, opening up for arbitrage opportunities. In other words, a Bitcoin could cost 10.000 USD in one exchange, and 10.110 USD in another, a price difference that can be exploited by traders.

Decentralised exchanges and protocols such as Atomic Swap with cryptocurrencies have been created to solve this issue. However, there are still unsolved problems for this to work such as sufficient liquidity, price discovery and matching of bids and asks.

There is no collective unit-of-exchange, meaning the number of currency pairs is very high, effectively evaporating liquidity. More, the matching needs to happen one-to-one with the size and price, making both price discovery and matching difficult. Lastly there is no order of transactions in many cryptocurrency networks, making it impossible to determine a fair way to order bids and asks. The consequence is dysfunctional systems for carrying out decentralised cryptocurrency exchanges.

The Lightning Network, supporting among others Bitcoin, is a network that can route payments between two different accounts connected to the network. This is done off-chain and only once everything is in place, transactions are triggered on the blockchain. The Lightning Network can in principle be used to exchange between two different cryptocurrencies like Bitcoin or Litecoin, by two parties, providing that the exchange rate is agreed between the two. The Lightning Network is limited to routing and cannot in itself act as an exchange, as it is incapable of price discovery and price matching, both necessities for a seamless exchange to take place.

Tagion has ordering, making it possible to do fair price discovery and price matching decentralised, which when combined with the routing functionality of the Lightning Network, lets the Tagion network accomplish decentralised exchange between Lightning Network compatible cryptocurrencies (Tagions, Bitcoin, Ether, Litecoin and more). Bids and asks are placed in the network, which gives full transparency and order depth for all users, not limited by a central exchange.

The Tagion decentralised exchange, DEX, always trades alien currencies against Tagions (TGN), which helps to create high liquidity and thus heightens the matching probability. For example, a user exchanging BTC to LTC means that two exchanges are required. The first is BTC to TGN and the second TGN to LTC.

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The exchange is supported by the guarantee model, where the part selling alien currency locks an amount in Tagions to their corresponding ask. If they then do not fulfil the order on their side by revealing the secret key for the Lightning-network, the guarantee amount is lost to the counterpart, which incentives for the deal to take place.

It is DEX that orders bid and asks, does price discovery, matchings and settlements. DEX utilises the needed channels and functionality from the Lightning network. It guarantees fair bid/ask price matching and fully decentralised order execution through the use of the latest innovations in the Lightning Network and Tagion that successfully solves the routing problem of the Lightning Network.

Due to the low-level system design, the order placing, and revoking will have some delay, adding friction and making price pumping by large players much riskier, resulting in a healthier balance between small and big traders.

The underpinning technology

While first generation DLT networks have expanded the possibilities to trade and transfer money and opened up for the use of Smart Contracts and the execution of decentralised applications, they have failed in becoming a practical, everyday tool for transactions, hindering mass adoption. The key areas that must improve for DLT networks to gain mass adoption are transaction and validation speed, efficient decentralised data storage, lower energy consumption, and providing ease of use such as when paying or exchanging from one currency to another.
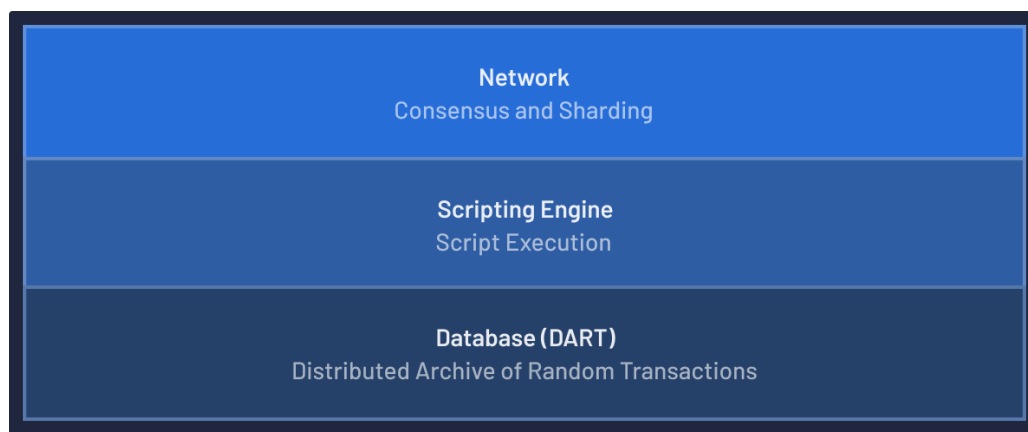
The Tagion system architecture

The Tagion system consists of different components, residing in three main layers.

It is architected so each layer - and each component within a layer - can be optimised individually, and also replaced individually when new and smarter technology emerges.

In this way the system can be kept current as technology evolves.

1) The top layer is the network. It consists of three main parts;
   a) The gossip protocol used for data synchronization
   b) The hashgraph algorithm used for consensus and ordering of transactions
   c) The sharding capability that, along with DART and the Scripting Engine, enables parallelism of transactions and provides the speed of the system.

2) The middle layer is the Scripting Engine that, based on input from the Network and DART, executes transactions and stores the output and deletes obsolete data from DART. Scripts are written in Funnel, a scripting language developed for the system, inspired by Forth[67]. Funnel is made robust and secure by limiting its functionality to be optimised for transaction execution. As an example, infinite loops are not possible.

3) The bottom layer, the database, DART (Distributed Archive of Random Transactions) stores all current bills (comparable to paper bills in a fiat system). Spent bills are deleted and receive bills are created in the database. Functionality is built in to automatically purge unused Tagions after some time, to avoid carrying orphan bills around forever.

   DART is built on design principles that are based on a licensed patent, which allows for optimisation of the execution speed a millionfold over other existing technology, by making use of an optimised sparse Merkle tree.

Network
Consensus and Sharding

Scripting Engine
Script Execution

Database (DART)
Distributed Archive of Random Transactions

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[67] https://www.forth.com/forth/

An important aspect of the Tagion system is that it only stores the output from transactions. The consensus data contains mere intermediary calculations.

The data flows as follows; a user creates a transaction, which a node puts into an event as a transaction script. The event is gossiped to the network and consensus is reached. The transaction is then executed by a node's scripting engine and the output is stored in the DART.

The Tagion system solves a number of issues that are inherent in most other DLTs. These are:

1) Volume of transactions
2) Speed of transaction validation
3) Energy consumption
4) Inefficient use of data
5) No ordering – unfair, discrimination and sequential execution
6) No sharding

1. Volume of transactions

Bitcoin processes 3-7 transactions per second. VISA does around 1,700 transactions per second on average (based on an average of 150 million transactions per day)[68], and the network can handle peaks of up to 65.000 transactions per second. For everyday use of cryptocurrencies to happen, it is the properties of VISA that should be the aim, and not the properties of most of the current DLT systems.

Tagion uses hashgraph for consensus, which in the Tagion implementation, makes it possible to process more than 20.000 transactions per second[69] per Shard. Tagion is architected to be able to scale to hundreds of Shards that operate equally fast in parallel.

2. Speed of transaction validation

Bitcoin uses 10 minutes on average to validate a transaction. On the VISA network validation takes place in two to three seconds. Transactions are validated in two to three seconds in the Tagion system, putting it on par with VISA in terms of validation speed.

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[68] https://hackernoon.com/the-blockchain-scalability-problem-the-race-for-visa-like-transaction-speed-5cce48f9d44
[69] https://www.hedera.com/blog/pulling-back-the-curtain-on-the-hedera-consensus-service

The fast validation time is reached by use of hashgraph for consensus and an efficient patent pending gossip mechanism. The hashgraph algorithm and the accompanying mathematical proof was discovered by Leemon Baird[70].

It solves the Byzantine Generals' Problem, a term that takes its name from an allegory developed to describe a condition, where actors must agree on a concerted strategy to avoid catastrophic system failure, whilst some of the actors are not trustworthy.

The algorithms makes sure that if more than two-thirds of the nodes in the network follows the same consensus rules, all will, in finite time, reach the same order of events – confirming and validating any action on the network such as a money transfer, money exchange, or data interactions.

The gossip mechanisms optimise data exchange between nodes to happen most efficiently. This mechanism is patented, and a perpetual license has been given to the Tagion project.

3. Energy consumption

In the world of cryptos it is well known that the most popular networks, such as Bitcoin and Ethereum are anything but energy conscious, as they lean against the proof-of-work protocol[71]. Tagion's proof-of-people protocol uses insignificant, close to zero, energy compared to proof-of-work.

The hashgraph consensus mechanism, DART, and the lean script executions allows Tagion to be operated on low powered commodity hardware, such Smartphones. In comparison, banks are settling transactions with other banks by use of multiple mainframe-based systems and proof-of-work based cryptosystems are demanding an ever-increasing share of the total power consumed world-wide.

4. Inefficient use of data

Most DLTs uses a decentralised immutable database for storage. The blockchain data structure is immutable meaning all data should be stored forever and cannot be deleted. This means that every network participant (usually referred to as miners or node owners) have a full copy of the database; processing, storing and exchanging huge amounts of data. The security in the blockchain lies in the whole chain, thus you cannot just delete old irrelevant data if you want to do a full validation, because then you cannot prove the data integrity with cryptography.

Tagion uses a distributed database for storage, meaning a node only stores a part of the data. DART gives away with immutability and only the output of a transaction is stored, while input and calculations are omitted, helping to reduce size. The innovation in terms of data utilisation is however that once a bill becomes irrelevant, it is deleted, rather than kept forever.

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[70] http://www.leemon.com/
[71] https://cacm.acm.org/magazines/2018/7/229045-why-cryptocurrencies-use-so-much-energy-and-what-to-do-about-it/abstract and https://cacm.acm.org/magazines/2018/7/229045-why-cryptocurrencies-use-so-much-energy-and-what-to-do-about-it/abstract

Tagion utilises a licensed patent pending validation mechanism to validate transactions stored in DART. A license has been given to the Tagion project. The mechanism transforms a problem that is burdened with an exponential workload in other systems into a linear workload, which saves vast amounts of CPU power.

5. No ordering – unfair, discrimination and sequential execution

Proof-of-work systems are probabilistic systems with no ordering, there is no accurate timestamp on each transaction. The miners decide on which transaction to put in a block and validate the transaction. It is usually decided by price but can also be chosen freely by the miner. It means, it is not necessarily the first to submit a transaction, which gets it approved first. It is also means it cannot function for ordering of bids and asks sorted by timestamps, do price-discovery and fair matching.

Another consequence is that everything is sequential, because it is a block in a chain a new block needs to be added, before new transactions can be worked on, where all are racing to solve the same problem. This is also related to the non-distributed data, which is a hindrance for parallel execution.

Tagion uses the Hashgraph algorithm to achieve fairness, because it has exact ordering of all events, transactions in the system. It is a deterministic system, meaning it has a finality, where the order is fully settled for all in the system. By having both a truly distributed data storage, which stores the outputs from transaction scripts and ordering it allows for parallel execution of transactions.

6. No sharding

Bitcoin, Ethereum and most other DLTs comes without sharding. Sharding allows for a network scale with more shards to increase overall system performance. By splitting the network into smaller parts greater scalability and performance can be reached.

Adoption

Tagion offers a number of innovations and services that are on par or surpass the services available in existing monetary or cryptocurrency systems, supported by a solid democratic governance model and non-collateralised e-money. To gain adoption actual services for users need to be developed and marketed to gain adoption. The Tagion system is merely an enabler, which will have no adoption by itself.

Along with essential services, such as a Consumer Wallet, Merchant software, and the capability of doing decentralised exchanges, Tagion is a complete offering for basic monetary services - transactions and exchange - from the outset.

Tagion is an alternative to the existing systems, and the team has chosen to focus on driving adoption with a bottom-up approach. With this approach, merchants and consumers would be the key stakeholders to reach for the Tagion network to get utilised, as the power of the payment infrastructure is in the hands of the consumer, so to speak.

The strategy for driving real use of the services in the Tagion ecosystem is to offer value added services, either directly or through ecosystem partners that will compete on real utility, price and stability.

Offering a functioning monetary system decoupled from political influence and banks will also by itself drive use. The incumbents rely on the existing ecosystem of services, which can be seen as a major advantage in mature markets.

However, decentralised systems provide new types of services that are not possible to operate in existing systems. This is especially true for Tagion, which due to its openness, low cost, and non-discriminating nature, fits very well into markets where the current digital banking systems do not thrive.

As an example, anyone with internet access can become a Tagion user. Tagion needs to support, facilitate, educate even part-fund applications that creates user value and adoption. A developer community is key to develop and create partners from.

Tagion ecosystem

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Initiatives such as those initiated by IMF and Facebook (Libra) are not seen as competing, as these solutions are not actual independent monetary solutions, but a way of adding some of the wanted features from DLT on top of the existing system, without solving the underlying issues.

Both rely on bucketing assets or currencies to support the value of their cryptocurrency, meaning they rely on the current monetary system and are hit by costs and issues such as infrastructure cost, transfer fees, inflation and deflation, exchange commission, market exposure risks etc.

The introduction of these systems by world-wide actors is actually an asset for Tagion. The fact that household names enter the DLT-sphere has lowered the bar of acceptance for end-users.

With Tagion being fully and democratically controlled by its users, it is the epitome of a democratised financial system - something the IMF and Facebook's DLT's have a hard time comparing to.

There are other crypto-projects that should be acknowledged such as Hedera, NEM and IOTA projects. Each of these projects solves some of the issues heighted

earlier, but none of them solves all of the issues collectively. Tagion does have an edge in the market by providing a new monetary system that is non-collateralised.

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Two basic key ecosystem enablers need to be available in the Tagion network before any adoption can start happening; DEX (decentralized exchange) and a wallet application.

DEX is one of the first features that will be released once the test network is fully implemented.

The wallet application makes the utility value of cheap transactions and DEX accessible for consumers, merchants, and traders etc. who would want to use the network. The wallet is also suitable for both for consumers and merchants, to use and store their Tagions.

DEX features will be added to the wallet application, making it possible to do seamless exchanges between supported cryptocurrencies, directly in the app.

The wallet (and other transaction services) will be very low cost in terms of transactions and enable seamless exchange between DEX supported cryptocurrencies, in practice allowing for creating multi-currency applications.

Tagion is currently developing a wallet solution with a third-party supplier.

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DEX and the wallet will help to drive up liquidity and provides the basis for user uptake.

They do however not cut it on their own. Several initiatives will be launched, alongside the go-live of the test network that will help to drive real world usage.

Here, limited trials with partners are planned for testing of the system capabilities on local markets such as in Ukraine and Denmark, where the current teams are located.

Ukraine is haunted by high inflation (14.4% in average, 2008 to 2018[72]) and high corruption rates (Ukraine is in the wrong third of all countries in the world, in terms of corruption in the public sector, according to Transparency International[73]).

Denmark is the opposite end of the spectre in terms of inflation and corruption rates (although parts of the Danish banking sector appears to behave in dubious ways[74]).

By starting test in two such diverse countries, several thesis's for adoption can be tested in vastly different environments. The test aims to both drive actual users onto the technology (wallet, DEX and the Tagion network itself), and to test a geo-

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[72] https://www.worlddata.info/europe/ukraine/inflation-rates.php
[73] https://www.transparency.org/country/UKR
[74] https://danskebank.com/about-us/corporate-governance/investigations-on-money-laundering

based incentive model that helps drive community building and that is applicable worldwide, once battle tested and adjusted.

Another vehicle for driving adoption is the partner ecosystem or developer community. The Tagion team is working on securing a number of partnerships for services such on and off ramping of fiat to and from cryptocurrencies (e.g. e-money license holders), of integration into e-commerce payment solutions and for development of the consumer wallet and the decentralised exchange.

Developer tools and open-source

Another corner-stone of creating adoption by creating superior user value comes from the creation of a healthy developer community.

Tagion will create a development package including a set of development tools and the executables that will allow developers to run a virtual network and build applications on top of this by using the interfaces for the system. The first package will be released in December 2019 and this will allow the community to begin to build on the core technology. Tagion is committed to drive and support the community in every way.

The Tagion network will eventually be totally open sourced. The open source license type is not fully determined yet, but it will be along the lines of GNU GPL.

When open sourcing begins in the near future, the Tagion team plans to have adequate resources available to properly support building a Tagion coding community, as the intention is for the community to assist in setting the direction for future development and to drive innovation on top of the system.

Tagion, the past, present and future

The first lines of code in the Tagion git, tagion_core main branch, dates 07-16-17, at the time of writing more than 1026 commits have been made and 75 pull requests.

Besides the core projects, external projects for debugging and visualization of the network has been developed and a beta edition of a wallet has also been developed. The main components such as the scripting engine, HiBon, the gossip mechanism, the consensus algorithms, DART, multiplex network API with SSL etc. are implemented and tested. A live broadcast from a demo network can be seen at https://tagion.org/about/network. The demo network has been live since December 2018.

Tagion was born in March 2017 and had the first two full-time employees since later Summer 2017, growing ever since with both more full-time resources, advisors and partners. Tagion has from the outset been funded by the management team focusing on delivering solutions to current problems from the start instead of selling hot air and creating paper tigers.

The management team has in various settings always worked with delivering solutions to prove ideas and concepts, leading to finalising complete products. For Tagion the team has been focusing on the development of not only concepts and theories, but also the practical implementation and testing of the core technology. The approach has been to get the most difficult challenges out of the way first, in order to prove that it was at all possible to achieve the technical vision for Tagion. The most difficult issues are solved and tested.

In September 2017 Leif Block Rasmussen joined as an external consultant and advisor on governance. His main contribution was the development and input to the governance thoughts.

In April 2018 it was proven that the team was combining technology in a completely new way as a thorough legal due diligence on existing patents on related technology was made. The diligence revealed that no existing patents are violated by the technology used in the Tagion system.

In December 2018 the first 0.9 conceptual whitepaper was done, including the main technical components and governance. This formed the foundation for the Tagion project.

On September 5th, 2019, a patent on DART, a distributed database tailored for the Tagion network, was filed.

With a demo network up and running, which includes all core components, patents filed, and a robust advisory network in place, the team is finally ready to introduce Tagion to the world. The Technical paper and the Whitepaper (this) have been written to document the solutions in depth and on a more general level including ideological opinions.

With the support of the Tagion entity, the plan is to launch an open test network in December 2019 with a developer package to enable developers to build applications on the network, or to run a local copy of the network. The build-out of the network happens continuously and will evolve into a beta network that is expected in Q2 2020, including a beta wallet. From here, the main network will become operational and later the DEX functionality will be added.

The governance mechanisms will be thoroughly tested and adjusted as the network becomes available and testing is possible. The network will slowly start to open up for the community to run their own nodes as the network matures.

The code will start to be open-sourced when the code has been documented and Tagion has resources to support the open-source process for the community. It is expected to be sometime in 2020, latest 2021.

Tagion is planning to scale the organisation to add more resources on core development and scientists on governance and economy, but Tagion is self-funded at the moment, which puts some restrictions on the projects. The aim is to obtain external support and funding in the future from partners that can contribute to the project.
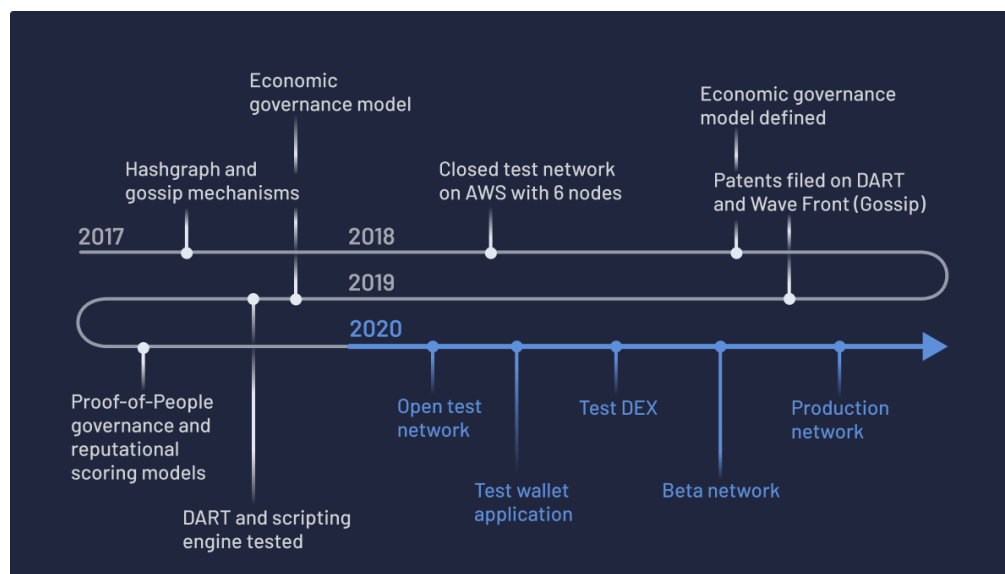
Tagion Entity

To create a genuinely democratic and decentralised monetary system, the team behind Tagion has placed the project in a non-profit company, Tagion.

Tagion entity owns the Tagion™ Trademark, the source-code (until open sourced) and is the legal entity behind the project. Tagion is run by a number of competent guarantors who are tasked to ensure that the right decisions are taken in order to pursue the goal of an economic sustainable world. The direction is formulated in Tagion's purpose, which is to "Fund initiatives that maintain and improve the network, as well as to "initiate, drive, and fund projects that further the adoption of the network".

Founders and core team

Theis Simonsen - *CEO and co-founder*
 https://www.linkedin.com/in/theis-simonsen-32035313/

Theis is an experienced strategist, developer, lecturer and executive. Prior to Tagion, Theis served as a senior consultant at KPMG and an external lecturer at Copenhagen Business School. He has driven and founded other companies as well.

Theis received an M.S. in Information Technology from I.T. University of Copenhagen.

His drive and passion for actually making a difference in the world and democratising the financial system make him a perfect spearhead for Tagion.

Kristian Vestergaard - *CCO and co-founder*
 https://www.linkedin.com/in/kristian-vestergaard-a59b4a/

Kristian brings 20+ years of experience as an engineer, software architect and leader to the team. Having started in an IBM's call centre, he quickly raised to software engineer and analyst before working as an external tutor and consultant for IBM and PwC.

His desire to seek new adventures brought him to audio world leader Jabra serving as a Director, Digital Strategist and Architect in Jabra. His knowledge of the informational structures and business understanding earned him a seat at the GN Netcom board.

In the early days of the Tagion journey, he simultaneously worked as GDPR consultant and Enterprise Architect at the largest power producer in Denmark, Ørsted.

His commitment to the project is best reflected in the sacrifices he has brought to the project by working two jobs to fund not only himself but also four further full-time Tagion team members.

Carsten Bleser Rasmussen - *CTO and co-founder*

in https://www.linkedin.com/in/carsten-bleser-rasmussen-80699915/

Carsten is the technical cornerstone of Tagion and responsible for low-level architecture and core network concepts – with more than 20 years of experience in low-level programming and ASIC design it is hard to find a person more capable of the task.

Before his Tagion days, he was co-founder and CTO at Polaric Semiconductor, specialising in design and engineering of NFC and Bluetooth microchips and leading an international team of over 15 engineers and chip designers. Prior to Polaric, he designed ASIC chips for Nokia.

Carsten received an M.S. in Electromagnetic Field Theory from the Technical University of Denmark.

Carsten has a brilliant ability to combine deep technological understanding with visions for everyday applications. A talent that made him part of the Giga core team. Giga that later was sold to Intel in one of the biggest acquisitions in Danish business history.

Tobias Ambs-Thomsen – *CMO*

in https://www.linkedin.com/in/tambsthomsen/

Tobias has over two decades of experience in visual communication and marketing in a variety of roles in advertising agencies and large companies, including creative lead, and marketing director.

Stirring a marketing department in growth is no strange thing to him. Before he turned to decentralised networks, he was Marketing Director at ACT.Global. A company that during his stay grew from 10 to 70 employees and moved from one to international seven markets as diverse as India, Thailand and Germany.

Tobias has a degree in graphical communication from Danish School of Media and Journalism and is probably one of the few kids that used to swap away from TV-shows in favour for commercial blocks.

Vladislav Pazych - *Digital Marketing Manager*

 https://www.linkedin.com/in/vladpazych/

Vlad, having started his career while still attending high school, has versatile experience in UI design, full-stack web development and with indie game development. He has, through his career, contributed to multiple high-stake commercial and open-source projects. This variety gives him unique perspective for marketing products as complex as a DLT and cryptocurrency. Vlad's main responsibility in Tagion is to build an active community of developers

Oleksandr Sushko - *System Engineer*

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Alex brings years of experience in application and system-level engineering. He has used most of his career creating complex B2B enterprise solutions. Prior to Tagion, Alex worked in a Polish company TERG S.A, taking the lead in development of multiple vital in-house applications. Alex quickly outgrew all his prior roles and now directs his talent to writing state of the art software for Tagion Core. Alex has a degree in Computer Science from Kyiv Polytechnic Institute.

Oksana Perederii - *Marketer and Office Manager*

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Oksana spends her time spanning multiple roles and takes care of as diverse areas as search processes for new employees, office care taking, as well as being an avid participant in all marketing discussions and in the forming of the marketing and adoption strategy.

Prior to Tagion, Oksana has experience from being a Project Manager at Polaric Semiconductor and from various marketing related roles for Together Networks, Kyiv Post, and MIZOL. Oksana holds a Master's degree in Enterprise Economics (Environmental entrepreneurship) from Taras Shevchenko National University of Kyiv.

Leif Bloch Rasmussen – *Systems and governance*

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Leif is an associate professor at Copenhagen Business School within IT and economics. He has spent his career as an academic worked with Commons, IT Governance, cybernetics information systems and converging of technologies i.e. nanotechnology and IT Innovation and entrepreneurship.

Richard Kastelein – *Strategy, PR & Media*

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Richard is a Canadian living in the Netherlands whose media career has taken him from the Canada's arctic in the Native press to the sunny Caribbean, and Europe. He has written for Harvard Business Review, Wired, Venturebeat and the Guardian and his work has been translated into Dutch, Greek, Polish, German and French. He holds an honorary Ph.D. at Jiangxi Ahead Institute of Software & Technology (Blockchain Faculty) in China and is the publisher of Blockchain News, Director of both Token.Agency and Blockchain Partners. He is also an advisor to Francis Ford Coppola's Decentralized Pictures (American Zoetrope) in Hollywood and several other projects.

Project Management Team

Shane McQuillan - *Founder & CEO, TrustedIn Trading*

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Sam Kawtharani - *Corl co-founder and Fintech Advisor*

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Strategic Consultants

Michael Harboe - *Strategic Advisor, CEO at Virsabi*

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Michel Avital *- Professor at Copenhagen Business School*

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In Conclusion

Decentralised monetary systems are on the rise, but the currently available DLT based monetary systems are facing various challenges which hinder mass adoption.

Tagion provides a solution to these challenges through a number of innovations, where to governance and money supply is key. The technology is an enabler of the system.

Tagion is a common good and governed as a common resource. The genuine democratic governance is secured by applying the principle of *one person one node*. Tagion reputational scoring model and proof-of-people protocol incentivises nodes to serve the network loyally. This approach leapfrogs the governance mechanisms in other 'decentralised' systems.

Tagions is a non-collateralized currency of the Tagion monetary system. The money supply is controlled intelligently to create an efficient market, where no central authority controls the supply. Instead, Tagion provides the basis for an algorithm, a kind of decentralised oracle, that controls the money supply by measuring on intrinsic variables to express velocity of money, adoption etc

Tagion's technical innovations include:

- Transactions volume and settlement speed on-pair with credit card systems
- Very low energy footprint
- The DART database, a truly distributed database enabling parallel execution in the network and efficient use of data.
- Use of hashgraph to provide fast consensus and correct (fair) ordering of events; transactions.
- A decentralised exchange, DEX, that allows for full order depth, fair matching and price discovery.

These features make it possible to make both exchanges and transfers fast and at a very low cost enabling microtransaction and giving an edge over current expensive legacy systems.

In summary, Tagion is an alternative to the current state backed monetary systems - the world's first truly non-discriminating democratic peer-to-peer e-money, built for everyday use.

The Tagion Team, October 2019.