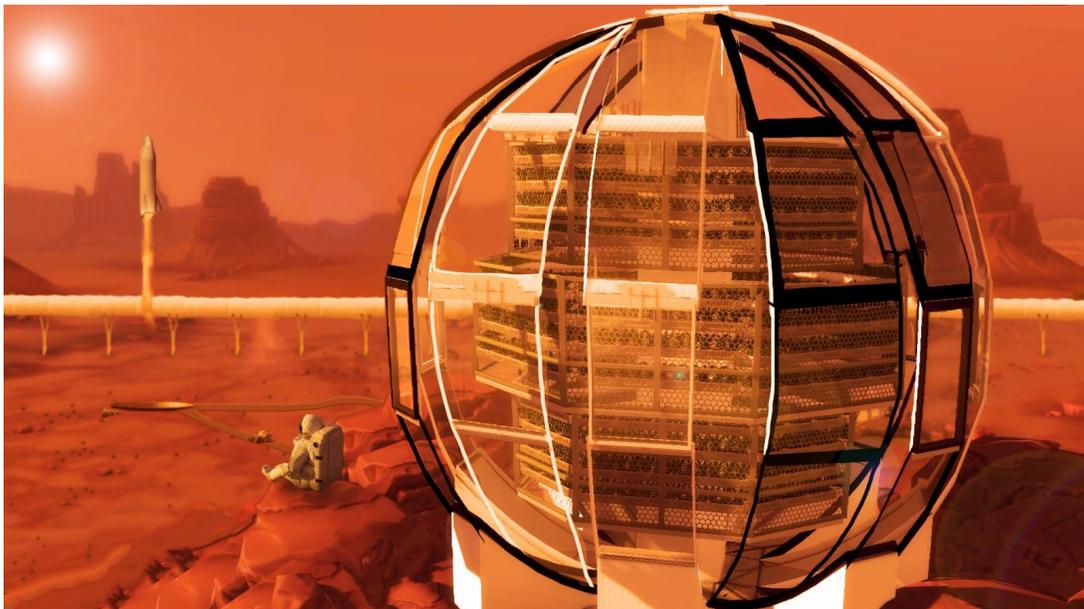


MARSCOIN

TRUSTLESS-LEDGER TECHNOLOGY IMPLICATIONS FOR A MARTIAN SOCIETY

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INTRODUCTION

It stands to reason that early settlers on Mars will be disinclined to fell their few precious trees and turn them into pulp to print little pieces of paper representing monetary value. We can instead expect them to utilize the breakthrough in computer networking and digital ledger technology known as “blockchains” to efficiently and transparently foster economic development, build trade among themselves and Earth, and leapfrog Earth’s financial system.

What is a digital trustless ledger?

Since its invention in 2008, when a cryptographer and software engineer using the pseudonym Satoshi Nakamoto released a whitepaper¹ on a proposed solution to the “Byzantine general’s dilemma,”² a veritable revolution in digital ledger technologies has been unleashed.³ This computer networking breakthrough, in which a group of network nodes in a hostile environment have to collaborate to establish a “history of truth” without being able to trust each other, suddenly enabled “trust” to become programmable. Shortly after publishing his whitepaper, Satoshi Nakamoto released a working implementation of his breakthrough idea⁴ comprising a combination of a variety of previous cryptographic innovations.⁵

The internet, itself a network infrastructure of distributed nodes, allowed computing technology to disintermediate services and eviscerate layers of administrative “middlemen.” Before the inception of the internet, many centralized services bridged various forms of “information discrepancy” between parties and were paid for such information-processing services. Whether such central hubs arose naturally or cemented their position by law, in either case, their necessity was challenged as the internet gained adoption, freeing up resources in

¹ <https://bitcoin.org/bitcoin.pdf>, “Bitcoin: A Peer-to-Peer Electronic Cash System”, Satoshi Nakamoto.

² https://en.wikipedia.org/wiki/Byzantine_fault

³ <https://www.wsj.com/articles/the-revolutionary-power-of-digital-currency-1422035061> “Bitcoin and the Digital-Currency Revolution”

⁴ https://en.wikipedia.org/wiki/History_of_bitcoin Creation of the first block: Jan, 3rd 2009

⁵ Merkle Tree, SHA-256, Elliptic Curve Cryptography, Hash Cash, DigiGold, B-Money, BitGold

capital and time in such varied industries as publishing, media, newspapers, and the music and film industry. Here, all of a sudden, the hurdle of entry for information distribution was dramatically lowered, allowing new content creators and new forms of content consumption to spring up and challenge the status quo.

A similar development happened in the physical realm, before the dawn of the Information Age, with the Industrial Revolution, when progress in automation allowed for higher levels of “division of labor,” unlocking capital and resources and uplifting society’s prosperity and living standards overall.

However, finance, capital, governance, and other services relying on an authority to properly adjudicate “ownership” were outside the reach of automation before the realization of blockchain technology.

With the advent of the capability to electronically create scarce resources that cannot be arbitrarily copied and distributed, but are tracked in ledgers that introduce a previously unattained form of triple-bookkeeping of a history of claims, votes, transactions, patents, ideas, and timestamps in a globally and immediately transparent way, Bitcoin became the first implementation on top of this new technological breakthrough.

Bitcoin exemplified for the first time how a trust history could be established that allowed a digitally scarce element—here used as currency—to be created and made tamper proof as well as transparent and instantly verifiable for everyone.

A new “level” of Information Age was attained that all of a sudden allowed the internet to move from publishing and media (information that benefits from digital dispersion) into the domains of finance and governance (information that needs atomic units that can’t be copied). Any administrative human endeavor that could be organized algorithmically could now be done programmatically—in theory—and thereby replace a whole host of human institutions that previously had to gather trust over time: replaced with cryptographically secured, computationally accessible, algorithmically directed transparent and “debuggable” problem solving.

Marc Andreessen had declared a decade earlier, “Software is eating the world.” With Bitcoin as its first foray into monetary policy and even more so its underlying blockchain technology proven, software’s march into breaking up inefficient intermediary layers in government, finance, insurance, patents, properties, and law indeed seemed to have officially begun.

Blockchain, cryptocurrency, and trust

The implications are far reaching, and a burst of innovation has led to a Cambrian explosion⁶ in ideas and implementations touching every aspect of traditional trust,⁷ shifting it toward the software industry: electronic voting with transparent and irrevocable records, triple ledger accounting based on computationally secured records, monetary policy implementations as varied as human positions on aspects of money in the form of cryptocurrencies, insurance, and lending with novel concepts such as DeFi, decentralized finance, on top of Turing-complete blockchains like Ethereum, property registration, and near-instantaneous swapping of ownership, based on tracking of such claims through the power of immutable programmable distributed ledgers.

Naturally, such innovation, while on planet Earth at least, faces its greatest resistance in incumbents that have historically been at the top of a country's power structure (government and finance in particular) when it comes to governing “trust.” At the same time it is particularly exciting and might constitute an extremely powerful technology for a Martian City State, a Martian colonial government, and other human outposts in the Solar System: The ability to orchestrate, govern and programmatically organize, while attesting trust, ownership, and data fluidly allows for the accommodation of sophisticated and highly efficient structures of civilization. From the creation of raw materials and the tracking of every unit produced, every piece of sensor data timestamped in an auditable fashion, up to the layers of law and governance of the entire colony itself—digital ledger technology allows for futuristic efficiency that previously would have required armies of humans to track and verify, categorize and adjudicate.

Furthermore, because blockchains are built on top of game-theoretical models to incentivize the chain of trust, they become extremely well-suited vehicles to incentivize desired behavior: from forcing economic participants to find better and cheaper power sources in order to unlock new digital units of currency (“mining”), to driving new colonization aspects (“first to establish a new blockchain off-world”) and allocating capital (“property registration based on pre-sale of the pre-sale of territorial claims”). Even the decision-making process which elements of

⁶ <http://parisinnovationreview.com/articles-en/the-cambrian-explosion-of-blockchains>

⁷ <https://www.cbinsights.com/research/industries-disrupted-blockchain/> for a list of 58 big industries affected by this new technology, including banking, voting, critical infrastructure security, education, mesh networks, etc.

Martian life should be prioritized could occur in a more organic, fair, transparent, and immediate way using the power of transparent yet privacy enforcing blockchains.

We will look closely into some of these incentive structures and discuss why they work and how they could be implemented.

A Martian Financial System

Bitcoin is a cryptocurrency and as such the first example of a technology that runs on a blockchain, a decentralized digital ledger. Bitcoin's value is entirely driven by supply and demand. Its value and adoption have risen dramatically since 2009. While its interpretation and use have changed over the years, it has become a "Money of the Internet" and is by far the easiest and most widely accepted "Internet Reserve Currency."⁸ While over a thousand other cryptocurrencies have since been launched, the "network effect" allowed Bitcoin to pull ahead of its competitors and establish its predominant position. Concepts such as "Hyperbitcoinization"⁹ extrapolate that Bitcoin, being capped at 21 million units and showing signs of following a stock-to-flow behavior similar to gold and silver, might eventually become the world's main global reserve currency due to Gresham's law.¹⁰

Built into Bitcoin's "digital gold" distributed software is the belief that a deflationary currency that replicates money similar to the Gold Standard that helped unleash the Industrial Revolution is an inherently better monetary policy for a financial system than centrally organized, opaque, political banking committees that print arbitrary amounts of new currency.

The Cantillon effect,¹¹ in which the proximity to such money issuance benefits the politically well-connected rather than the industrialists and innovators, is seen as a reason for wars, cultural decline, and an increasing wealth gap.¹² However, other monetary policy models exist for cryptocurrencies, but haven't had the same impact yet that Bitcoin has. Some governments have decided in recent years to develop their own (still centrally controlled) digital ledgers in

⁸ https://en.wikipedia.org/wiki/Triffin_dilemma - St. Louis FED, Oct 2018: "The Triffin Dilemma refers to the double-edged sword of possessing a currency that serves as the world reserve currency. If a private cryptocurrency were to replace a given world reserve currency, this would eliminate the dilemma for that currency" <https://t.co/NgzPLcWbMM>

⁹ <https://unchained-capital.com/blog/law-of-hash-horizons/>

¹⁰ https://en.wikipedia.org/wiki/Gresham%27s_law

¹¹ <https://www.aier.org/article/cantillon-effects-and-money-neutrality/>

¹² <https://medium.com/@cryptodiscipulus/the-bitcoin-standard-a-book-review-22a03a719931>

order to exert control over these new blockchain technologies.^{13 14} Regardless, a future financial system will most definitely be distributed, cryptographically secure, peer-to-peer, and instantaneous: allowing for the leverage of capital when it is needed, where it is needed in a highly automated and efficient way. Imagine a “hive” decision by colonists to extend a new hyperloop tunnel on Mars. Via transparent, cryptographically secure voting,¹⁵ 60% of the colonists decide that this project is a go and perhaps commit their funds to the project directly with their vote. If the vote reaches execution limits, capital gets allocated and materials purchased, work-orders and time-schedules dynamically adjusted, etc. The colony will always coordinate its activities this efficiently, as the information flows immediately between the participants.

Even discussions about specifics of this system could be put to public voting panels in which proposals gather direct participation. This is not to say that politics will disappear even in a system with capital so readily available for the tasks at hand: Colonists might decide to pool resources, let avatars do the voting for them; some might feel very strongly about certain items on the public agenda and try to sway the public to vote or dedicate more capital to a particular project. The “systems engineering” of how such a colony wants to set up rules for their “hive mind”¹⁶ can ultimately be left to the individual colonies that might spawn on-planet or off-planet. However, similarly to the “leapfrogging” on Earth, where cell phones and smartphones arrived before landlines in some developing countries, we assume that a Martian colony will much rather implement a resource-saving, electronic form of money which is fair, i.e. decentralized, than any form of paper-printed slip of gold-receipt—or much worse, a note backed by nothing but one party’s say-so, which the astute reader may have noticed is *exactly the definition* of fiat money.

¹³ <https://www.coindesk.com/the-bahamas-will-launch-a-digital-currency-pilot-tomorrow>

¹⁴ <https://www.wsj.com/articles/china-rolls-out-pilot-test-of-digital-currency-11587385339>

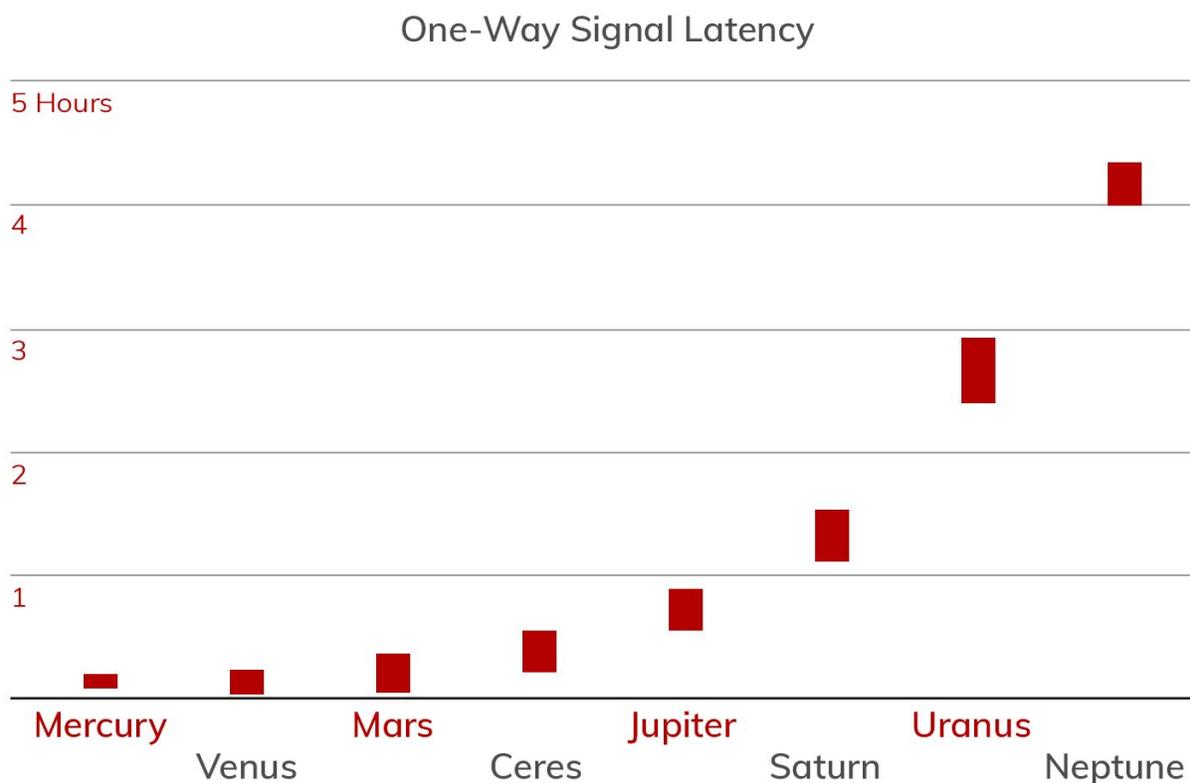
¹⁵

<https://www.theverge.com/2016/6/2/11837590/elon-musk-mars-government-direct-democracy-law-code-conference>

¹⁶ <http://bitcoinhivemind.com/>

Marscoin

Two factors prevent Bitcoin from ever playing a direct role on Mars: the speed of light in communication with planet Earth and the network effect of being “first.”¹⁷ Delay between the planets (“light speed penalty”)¹⁸ encourages a restart of Bitcoin on Mars:¹⁹ A “Marscoin”.²⁰



¹⁷ In <https://unchained-capital.com/blog/law-of-hash-horizons/> the authors propose a concept of “center of hash” which determines the center of hashing power to remain close to Earth for the foreseeable future. A Martian independence from Earth thus demands hashing independence. Mining Bitcoin on Mars will not be possible. (“Earth Hash Horizon”)

¹⁸ <https://bitcoin.clarkmoody.com/posts/bitcoin-interplanetary-frontier>

¹⁹ First Law of Bitcoin Astronomy (or “The Law of Hash Horizons”): Given constant hashrate, as a miner moves away from the center of hash of a blockchain, the number of blocks won by that miner statistically trends toward zero. (<https://unchained-capital.com/blog/law-of-hash-horizons/>)

²⁰ <http://www.marscoin.org>

The process is fairly easy: The first colonists will already bring with them some computing infrastructure that will very quickly replicate a local network of computers and most likely start out using the same TCP/IP protocol known on Earth (perhaps with some modifications²¹).

The decisions of the first few settlers will most likely determine their favorite ledger technology, but once a software client has been selected or perhaps even brought from Earth, nothing much remains to be done than to run mining nodes and allow colonists to keep a record of their “coins” with personal wallets.^{22 23} Over time, new features might be added to the blockchain or programs developed that interact with the blockchain via side-chains or as decentralized apps or as simple hash values anchoring external data into the immutable main Martian ledger.

This network ledger will operate with the speed of light on Mars and lend itself to a wide range of uses, for instance:

- Keep track of sales
- Property transfers
- Permanent receipts
- Votes
- Immutable record of ideas/innovations
- Immutable Record of data from factories, sensors, production

Similar to Bitcoin, the early Marscoin network “coins” will not be very valuable as such, but as scarce limited digital entities, they allow parties to “keep score” and account for transactions needed to fulfill a wider human social credit system²⁴.

A Marscoin ledger functioning like Bitcoin immediately creates an interesting virtuous incentive: Those who come first, who decide to move to the colony and risk more as “early adopters,” gain the benefit of mining the currency when the number of participants is still low and the issuance of coins greater.²⁵ A digital “gold rush” scenario. Tying this Marscoin network into a property-allocation system further increases the incentive to join the colony and pool resources into it.

²¹ Geotagging could be built into lower levels of the network stack in order to avoid outside influence.

²² <https://disaster.radio/>

²³ <https://wallet.marscoin.org/>

²⁴ <http://fisheconomics.org/episodes/episode-4> “Making Money”

²⁵ <http://www.marscoin.org/how/>

Incentive 1: Measuring Choices

While it is true that a very primitive colony of a few individuals will operate much like a family or military unit, a larger body of humans, perhaps more than Dunbar's number of individuals,²⁶ will want to find ways to measure choices, incentivize actions and in general keep track of social credit between its members.²⁷ For instance, some activities will require a variety of resources. Different food items, as a very basic example, will require different amounts of energy and work to produce. A simple cryptocurrency allows all members of the colony to know which articles produced had more resources and work applied to them. This will enable everyone to still enjoy the highest forms of goods, but also signal via pricing where the colony needs more innovation and efforts. It allows for a fair and automatic distribution of the results of production under resource constraints and a variation of desires and choices by colonists that have to be met over time. The colonist may enjoy a higher-priced mushroom one day while eating algae most other days. However, the natural ability for price signals to alert an entire city of humans to which items run low and which ones are abundantly available ensures that the "hive mind" of the colony²⁸ is very well aware of everyone's needs. Marscoin as a currency fulfills this basic economic function of money.²⁹ Additionally a systemic issuance of the coin to the entire population, based on a mathematically pre-set rate, prevents the abuse rampant on Earth with its highly politically-linked central banking: the desire to create laws and establish financial limitations in order to extract a higher price from the populace by artificially setting arbitrary boundaries that protect incumbent industries and prevent innovation or disruptive enterprise. Such dangers to innovation, as pointed out by the idea of a technological stagnation since the end of Bretton Woods,³⁰ or at the very least a challenge to innovative disruption through the power of centralized, monopolistic governance, is a threat that cryptocurrencies potentially address. Ideally, such improved financial underpinnings³¹ of the "New World" colony on Mars incentivizes constant innovation. Such innovation is fueled by enticing capital accumulation of a hard asset (a non-inflationary coin like Marscoin). This induces the necessity to improve

²⁶ https://en.wikipedia.org/wiki/Dunbar%27s_number

²⁷ <https://doi.org/10.1093%2Facprof%3Aoso%2F9780199586073.001.0001> "The evolutionary psychology of economics"

²⁸ <http://www.kierandkelly.com/complexity-economics> "A complex equilibrium is a progressive structure of integrated emergent diversity (that emerges, layer upon layer, from the bottom up), self-organized and fine-tuned by mutually adaptive, symmetry-breaking, co-emergence. Progress in a CAE is driven by the constant balancing interplay of innovation and upheaval; innovation brings forth the new at the expense of the old"

²⁹

<https://cointelegraph.com/news/is-cryptocurrency-real-money-brief-discussion-on-major-issues-surrounding-debate>

³⁰ Peter Thiel, et al: <https://danwang.co/why-is-peter-thiel-pessimistic-about-technological-innovation>

³¹ "How an economy grows and how it declines" <http://fisheconomics.org/episodes/episode-1#form>

productivity, quality and innovation for participants in the market place in order to earn through voluntary exchange these coins from other members of society. True wealth creation is the result: a desire to create products and services in abundance that are superior in quality and innovation, thus kindling the spirit of human creativity and uplifting society by improved living standards overall.³²

Incentive 2: Raising capital for the colony

Let's consider two possible scenarios. First, in the event of a pre-colonization capital raise: Capital could be raised by establishing a prior-to-departure Marscoin cryptocurrency network on Earth, involving potential colonists and investors to utilize a coin whose ledger might one day be transported and installed on Mars—with a record of the participant's/patron's previous "on-Earth" balances. Thus an Earth-based investor will benefit from an expanding Martian economy by proxy. This methodology follows early English concepts of investing in North American colonies and their future prosperity. Such a coin could be useful as an alternative currency to Bitcoin on Earth and develop its own life later on on Mars. The project Marscoin.org experimented with this concept by donating a large amount of coins to the Mars Society as a benefactor seen to promote the future colony and its financial system indirectly³³ and become a catalyst of colonization efforts.

In a post-colonization capital raise: Certain actions desired to be taken by the Martian colonists are paid for to a proxy on Earth. For instance: National Geographic wants to recruit Martian colonists to film a documentary on their behalf. They pay a local organization that is holding Marscoin from pre-colonization days. The payment is received on Earth; an encrypted message is delivered to their counterparty on Mars. The Martian financial proxy pays the local Martian colonists a "fee" for doing work for their Earth-based employers. This scenario is also possible without a pre-launched local cryptocurrency. However, such a pre-colony currency allows for private/public key control over remote funds. Alternatively, funds could be sent directly to Mars using a DSN between planets (but with delayed payment arrival) or a slower-block-generating intermediary network. An intermediary, very slowly updating, inter-planetary blockchain

³² <https://mises.org/what-austrian-economics>

³³ Roko's Basilisk comes to mind: The idea of such possible benefit spawns the necessary incentives to create a reality that effects its own creation.

“Interplanetary chain”³⁴ would allow for such payments to be issued in a decentralized manner, reducing counterparty risk.

Other, more mundane, ways of raising capital abound: For instance, a large mining conglomerate on Earth decides to establish a subsidiary on Mars. It’s not just easy for them to incorporate an ICO-based company on Mars that’s immediately tradable on the Martian colony’s stock market (gathering local capital, allowing for local hires and preparatory work), but furthermore, they can use their wealth on Earth to staff a ship or a series of ships, purchase the necessary resources and mining equipment and send it all off to Mars. Once on Mars, the local colony could request tariffs on the newcomer—paid in Marscoin. As Marscoins are mined locally, the mining company comes prepared: They sell equipment and computing parts or any item difficult to obtain on Mars to the colony for the right to land or for a certain amount of Marscoin to fund their local operation or for rights on mining property. The same scenario can be repeated with nearly any large industry that exists on Earth and desires to get an early foothold on Mars.

Incentive 3: Selling land ownership

Land ownership is a particularly interesting area for consideration. As the land surface on Mars is as limited as on Earth, it stands to reason that ownership thereof—as long as property rights can be enforced—represents a particularly valuable scarce resource that might attract investors and colonists.

Using blockchain and digital ledger technologies, very clear lines can be drawn in the sand. A global property ledger can easily be tied into an existing “Marscoin” blockchain by hashing new property purchases via hash transactions into the immutable ledger. Published display of such data, a registry similar to title registration on Earth, makes it easy to verify who owns what and where. The local Martian colony could promote land for sale to Earth-bound humans, who have to pay a fee in Marscoin to acquire such land. An auction system could be envisioned that ensures prime real estate allocates large capital to the Martian colony, which in turn can fund a police force or some form of guarantee of the new owner’s property rights. Perhaps such grants will come with the requirement to pay a large yearly penalty for the period of time that an

³⁴ The benefit of such a blockchain is its slow block creation. While Bitcoin and Marscoin have on-planet and real-time needs for fast financial transactions, this Interplanetary chain does not need lightspeed execution and might gather blocks of transactions which are passed and then verified in a manner of days. Whether such a system would work better with proof of work (mining, potentially always in favor of Earth) or an equal proof of stake (fairly distributed between nodes on Earth, Moon, Mars, and perhaps neutral nodes at Lagrange points) remains to be further analyzed.

Earthling does not take possession of his property on Mars—in order to incentivize new colonists to join and avoid wealthy Earth organizations acquiring Martian land. At the very least, offering land allows Martian colonists to capture Earth capital and shift that capital in the form of shipments of needed goods and attract more colonists. Inversely, the outflow of capital to Mars also puts pressure on Earth at some point: In order not to lose the brightest and highest risk takers and innovators, Earth is forced to offer a little bit more than just her natural beauty.

Local colonists could be granted benefits to purchase land much easier than from off world, thus allowing early risk takers to be able to gain more access to this limited land resource, incentivizing humans further to make the arduous journey and add to an ever increasing need in human capital on Mars. All of this goes to show find that selling land ownership in and by itself could be used to raise funds post-colonization, or, in a very creative manner and perhaps if found to be practicable, as a general principle to establish the funds needed for launching new colonies in space (on Asteroids, other moons, etc). Consequently, we will see the emergence of electronic stock/token markets, highly liquid and tradable, similar to the ICO boom in 2017, with layers of private auditing and self-regulating rating agencies that offset potentially rampant scams such a free and explorative technology attracts. However, given the high risk of frontier life in general, there will probably be a much higher appetite for and acceptance of risk overall. As an outcome of such market places that allow the easy formation of companies and the pooling of capital for common ventures, Mars will turn into an energetic hotbed of innovative endeavors for colonists to further explore and exploit the resources of the solar system for their own benefit while using their Marscoin to keep track of their fortunes and successes and as a way to measure risk and danger, using prices as indicators for needs and demands. We might even see the emergence of a “new colony marketplace” in which new colony proposals vie for the public’s attention in the hope of launching a new colony off—or on—planet: If such a proposal gets enough support and raises enough capital this itself will be an indicator that signals to everyone involved whether its time has come to be a worthwhile enterprise.

Incentive 4: Improving energy production

One of the interesting side effects of Bitcoin’s game-theoretical underpinnings³⁵ is the incentive for transaction-verifying participants (“the miners”), who are tasked with bundling transactions and incrementing the blockchain in a race against each other and incentivized by the issuance of new network coins, to find cheaper and cheaper forms of energy. Bitcoin’s

³⁵ <https://blockgeeks.com/guides/cryptocurrency-game-theory/>

consensus protocol is built on “proof of work,”³⁶ a method in which the first miner to successfully match a number of unconfirmed transactions into a block that connects to the most recent block of the Bitcoin blockchain. However, finding as many hash values per second as possible led to a race from CPU mining to ever more sophisticated devices generating exahashes³⁷ per second and turning Bitcoin into the most cryptographically secure computer network on the planet.

Marscoin on Mars, while potentially open to alternative consensus protocol options such as “proof of stake” or “federated consensus,” which involves varying amounts of centralized nodes that take on the role of verifying new transactions, could also be set up to operate on a proof-of-work methodology. This would incentivize Martian colonists financially to (independently) seek out more and better ways of generating power.³⁸ Such an economic power race could incentivize capital from Earth to find its way to Mars to either build more power plants. While it does raise the issue of a large amount of power seemingly “wasted” on confirming digital transactions, it still appears to be the most decentralized and “fair” way to operate a digital ledger and would incentivize a range of independent parties seeking out new ways to add power sources to the colony. The colonists themselves overall would benefit from such incentives as power will tend to become cheaper and more plentiful as well as decentralized and thus more reliable. Mining itself will never capture more than a certain amount of the new power resources unlocked, but it inhibits power subsidies and artificial limits on power production as it is in the best financial interest of all participants of the network to find ways to generate more power more cheaply.³⁹

Incentive 5: Spawning new colonies

In his “Bitcoin Astronomy,” Dhruv Bansal argues that “Distance makes hashes grow stronger”⁴⁰ and conjectures that, due to “blockchains, distance, and artificial scarcity,” a continued space race will be fueled by the desire to establish and launch planetary or solar-system-wide

³⁶ <https://medium.com/@danhedl/pow-is-efficient-aa3d442754d3>

³⁷

<https://www.bitcoininsider.org/article/83213/bitcoin-mining-investment-strong-btc-hashrate-surpasses-all-time-high>

³⁸

<https://news.bitcoin.com/how-big-hydro-power-partners-with-bitcoin-miners-to-prevent-energy-waste/>

³⁹ At <http://unenumerated.blogspot.com/2017/02/money-blockchains-and-social-scalability.html>, Nick Szabo argues that PoW allows for social scalability which comes at a cost but is still a savings compared to any other non-computational processes that do not involve a form of proof of work.

⁴⁰ <https://unchained-capital.com/blog/law-of-hash-horizons/>

precedence of “reserve currencies” which, due to their primary establishment and lightspeed penalty advantage, confer weight and economic power to the originators of such new regional space blockchains.

A race to extract benefits from a network effect turns into a space race: When humans have mastered to live in self-sustaining biospheres that are replicable across solar systems and adapt to varying environments, the next question that will have to be answered is on which monetary communication protocol they will build their economic interactions. The difficulty in overcoming an already established network seems to be apparent in observing Bitcoin’s tremendous market share after over a decade of nonstop activity by over a thousand competing protocols. Satoshi and anyone who participated in the first few years of Bitcoin mining are still the richest and most powerful individual holders of Bitcoin—a position they earned through the risk and early adoption when their project seemed outrageous.

A mission to Proxima Centauri—in the far future—could very well be launched by a group of wealthy solar-system residents who outfit a ship and crew each contributing a “share” as in the days of English merchants hoping to get a stake in a new North American colony ahead of time. This might be seen as a high risk high reward operation. If their stake succeeds, future generations will benefit directly from having access to a perhaps by then centuries old primary blockchain running in the Proxima Centauri system underpinning the financial network. Or, even more direct, the investors might be able to “send” their digitized minds across space to enjoy the benefits of the new world they helped establish.

More immediate, however, and more relevant will be a similar need for blockchains within the wider solar system: Travel times of a few years between locations in the solar system⁴¹ might make it lucrative to establish “blockchain centers” of hashing power in a new area and to dominate that region simply by setting a precedent⁴². Thus a series of solar system “hubs” of economic power and trade wide evolve over time.

Incentive 6: Innovation

The incentives discussed so far have to be seen more as a placeholder than an exhaustive list. Due to the game-theoretical underpinnings of blockchains many other desired behaviors can be

⁴¹ <https://www.amazon.com/Case-Space-Revolution-Spaceflight-Possibility/dp/1633885348>

⁴² Bitcoin Maximalism makes this case most eloquently. Hence the slogan “one planet, one chain” takes this concept further and only makes an exception to Bitcoin’s preeminent role by acknowledging the speed of light limitations in relativistic information travel.

built into the organization of a colony that uses digital ledger technology as their administrative layer.

For instance, we could monetize the issuance of new innovative patents and automatically distribute funds from a colony-wide “treasury:” Some cryptocurrencies like DASH,⁴³ Decred,⁴⁴ etc. have built treasury functions into their network that dedicate a certain percentage of all newly minted coins to a developer team or a generic fund. New projects which get publicly voted for by all members according to their percentage of “coin staking”, i.e. amount of participation in the network, decide over the fate of these minted treasury funds. Such a Colony Fund, which no particular group maintains, but which lives in the Marscoin network itself and can be tapped into by a vote of Martian colonists or by reaching certain milestones (“issue a new patent and automatically earn a fixed reward”), could be a great way to incentivize behavior the colony deems advantageous. Participation in voting could be incentivized. Cartographically exploring the Martian surface and posting video and positional data back into the colony’s database could automatically unlock coin issuance to your wallet. Adding infrastructure utilizing your own funds, too, could be monetizable. The design of the colony’s “liquid democracy” now becomes a software systems design paradigm, and extensions and changes bring the political model of the colony into the realm of engineering. Hence purely political agendas based on charm and propaganda might be harder to get away with—in particular when prediction markets are used to sort out sentiments and git-like law repositories become public forums of improving the machinery of the colonization to adapt to the desire of the many and the needs and prosperity of the majority. There is no powerful individual body of humans controlling the “system” aspects. Those colonists who do not agree with certain methodologies of administration are left with a choice to directly propose an upgrade to the public at large or establish a new offspring of a colony with a different ruleset. In fact, a desire to tweak a colony design and pursue a different “branch” of codex might very well push the space frontier a bit farther out.

Powerful individuals or corporations that created a huge benefit for the colony in the early days or through their particular services might still impact the colony’s rules, but have to sway a large majority of the colony at once.

⁴³ <https://docs.dash.org/en/stable/governance/understanding.html>

⁴⁴

<https://proposals.decred.org/proposals/c96290a2478d0a1916284438ea2c59a1215fe768a87648d04d45f6b7ecb82c3f>

A Martian Republic for the 21st Century

How might the embrace of digital ledger technology impact life in the Martian city state? One caveat would be that the range in which these technologies are implemented will probably change over the life span of the colony and depend on its size and living conditions.

How would such a system be implemented? What parts are needed? A rough schematic of how progress could unfold might look as follows:

1. Creation of an open-source Marscoin network on Earth, pre-colony
2. Marscoin Foundation to support development efforts of the network⁴⁵
3. Inviting the public to use the cryptocurrency and become part of the network
4. Possible sale of land via land registry as a smart-contract system
5. Further efforts to incorporate governance and record keeping so the network participants gain a way of inter-communicating
6. Launch of the first colony ship, carrying a copy of the ledger
7. Small mining device (Raspberry Pi, small USB ASIC, etc.) added to the Mars network and the Marscoin network restarted on planet
8. Martian colonists receive a smartphone-like device with builtin wallet⁴⁶
9. Marscoin proposal system is publicly visible on monitors in the colony and mobile device
10. Colonists can vote on proposals
11. Colonists will start to gift, earn, and sell Marscoin among each other to optimize resource allocation
12. Higher priced items on Mars will attract more attention, and the desire to capture the higher value will spark endeavors to innovate
13. The colony launches a stock market that allows colonists to form companies, raise proposals as teams, raise funds as a team, and pool their resources together without taxing the overall colony
14. The colony operates a budget to attract capital from Earth for further expansion
15. Companies raise capital directly from Earth to earn by providing services to the colony or services to Earth governments/corporations

⁴⁵ Similar to the Ethereum Foundation or Blockstream

⁴⁶ Initially a WiFi based system in and around the colony, in later stages a cellular system using Starlink components for global reach

16. Additional modules for patenting innovations, streamlining operations, decision making are added to the public, open-source Marscoin network
17. Laws are implemented—to the extent possible—as smart contracts, with issues and change requests publicly visible and being voted upon
18. An Interplanetary Coin node is setup and linked to the DSN, connecting the economies of Mars and Earth

A Virtuous Cycle Incentivized

The utility of digital ledger technology in new space colonies and in particular on humankind's first step into becoming a multi-planetary species cannot be overestimated. The range of applications that span from basic IoT devices measuring a colony's output to trade interactions across the solar system point to an ample field of applications in which transparent yet immutable accounting between individuals and spacefaring groups will become an indispensable tool of self-organization.

We predict that, just as other frontier technologies (bioengineering, nuclear, robotics) will be freed from Earthly constraints—whether political or administrative, cultural, or a general risk-adversity—Martian experimentation in the arena of programmable realtime digital ledger technology, blockchains, cryptocurrency, and decentralized finance will be dramatic yet inexorable.