



*Engineering
Intelligent Content*

Blockchain Strategy Introduction – December 2017

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*Our vision is that all the world's video be
accessible as data*

To achieve that, our mission is to scale rapidly

*Blockchain presents an opportunity to move
forward on both our mission and vision*

Linus Set to Launch World's First Video Blockchain



Why

- Video Virtualization makes a video blockchain possible
- Video accounts for almost 80% of internet traffic
- The Linus virtual video blockchain has the potential to revolutionize the way video is distributed and consumed around the world

Current Limitations

- With current methodologies a video blockchain would be impossibly big, due to the size of the video files
- The internet standard video format of MP4 does not work in a blockchain

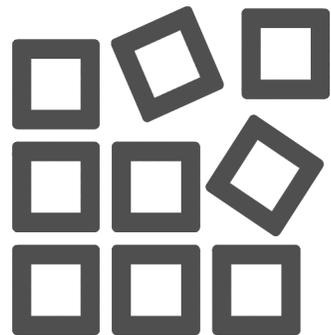
Linus Solves This

- Virtual videos are 'data files' and are fractions of a percent of the size of current videos
- They're ideally suited as digital assets, which can be recorded, transferred, and managed by a blockchain

In line with Linus' strategy of integrating with market leaders such as Microsoft, Amazon and IBM, the Linus Blockchain will utilize market leader Proof of Work to guarantee the integrity of the ledger- Bitcoin and Ethereum both use Proof of Work

What is Blockchain?

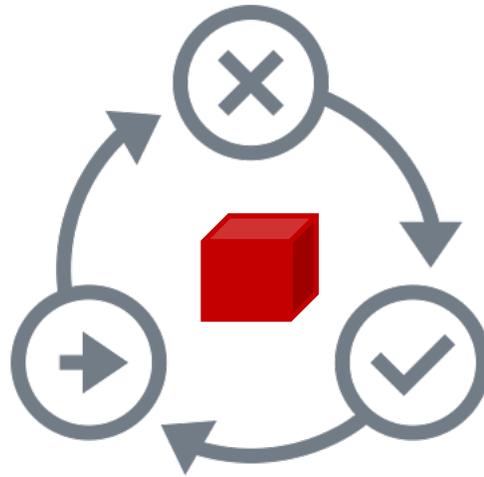
”[Blockchain is] a way for one Internet user to transfer a unique piece of digital property to another Internet user, such that the transfer is guaranteed to be safe and secure, everyone knows that the transfer has taken place, and nobody can challenge the legitimacy of the transfer. ”



— Mark Andreessen

What Does Blockchain Do?

- ✓ Blockchain secures and formalizes digital relationships
- ✓ With an auditable history
- ✓ Over a peer-to-peer network with no central control
- ✓ Currently it is reliable, but slow and expensive



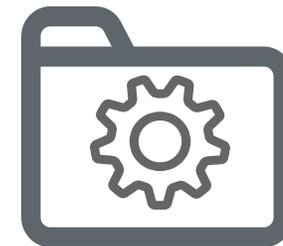
(If you are new to blockchain, you may wish to refer to Appendix A, "How Bitcoin Works")

Blockchain & Video

- The further a video gets from the content owner, the less ability there is to enforce copyright — to the point where video piracy accounts for \$20.5 billion in lost revenue in the US alone
- Content owners are focused on stopping users from passing content between themselves
- Blockchain provides a marketing opportunity — it embraces that people and organizations pass content in a decentralized way, but provides a way to manage and monetize it
- Blockchain holds the promise of returning value to content producers and owners, and delivering whole new monetization models

So far, blockchain hasn't been applied to providing these benefits to the video industry, because of current limitations:

- Video files are too large
- The internet standard video format of MP4 format does not work in a blockchain



How Does Linius Solve This?

As an “asset”, cryptocurrency is a single line of letters and numbers - It’s really just a text message

- Even with each coin being only a single line, the Bitcoin blockchain is well over 100 GB

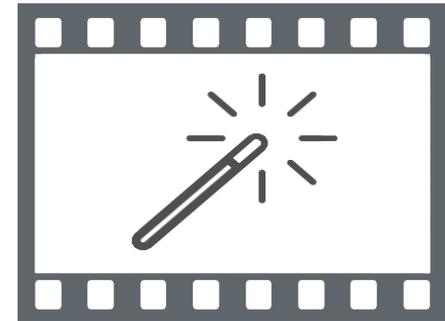
If videos were to be stored the same way, the blockchain would be impossibly big

Further, the standard for video files on the Internet — MP4 — has no tie to ownership

- Even if you could store the MP4 files somehow as an asset, all you would be able to do is “prove” ownership
- But once that asset was copied, there’s no way to tell what the copy is
- Therefore, the “double spend” problem that blockchain is designed to solve for currency doesn’t work with existing video technology

That’s where virtual video comes in:

- Virtual videos are fractions of a percent of the size of current video storage sizes
- They’re ideally suited as digital assets which can be recorded, transferred, and managed by a blockchain, providing an incontestable audit history



*Linius' virtual video makes
it possible to apply blockchain's
guaranteed ownership of digital
rights to video*

How Does It Work?

Ensuring Integrity of the Chain

- In most current transactions, integrity of the transaction is ensured by the centrally trusted source (e.g., Visa)
- One can imagine that in a studio-controlled distribution model, centralized trust would be sufficient
- But if users, Indy producers, and studios are to all operate on the same network, then trust must be established in an untrusted environment



Blockchain is perfect for this situation



Current blockchains use a variety of mechanisms to guarantee the integrity of the ledger

- i.e., proof that a transaction is real

Proof of Work is the most well known

- It's what Bitcoin and Ethereum use

Proof of Stake is cheaper and faster

- But has a broader range of potential security holes

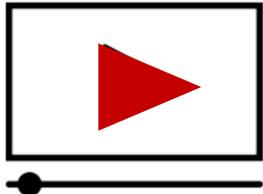


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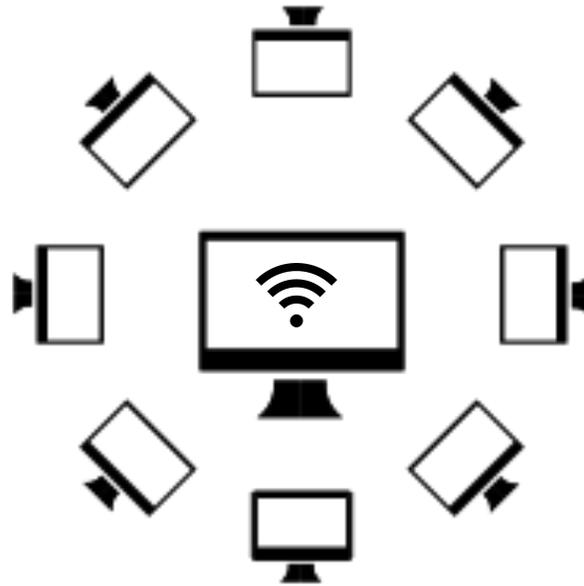
1. The creator of a video generates a virtual video, and registers ownership of it in the Linius blockchain
 - The creator also generates digital contracts surrounding payment terms and rules for distributing or cloning that virtual file
2. When a virtual file is cloned, ownership is registered in the ledger
3. When that ownership is transferred, the transfer is registered in the ledger
4. Ownership is stored in the block as a hash of the uniquely identified hash of the virtual file, and the public key of the new owner
5. Miners use proof of work to validate the transaction
6. The virtual file is uniquely identified by a hash encoded in the user-data section
7. The Linius Player, the equivalent of the Bitcoin wallet, passes the hash of the virtual file, and a rehash by the private key of the owner to the Linius Authorization Engine
8. Ownership of the virtual file is validated against the Linius blockchain by comparing the requested hash to the registered hash-of-hash using the purported owners public key
9. Only when there is a consensus, i.e. all parties are happy that the video should be played, do Linius ship the actual video data and play the video

Virtual Video in A Blockchain

A video owner virtualizes his video and registers ownership with the blockchain



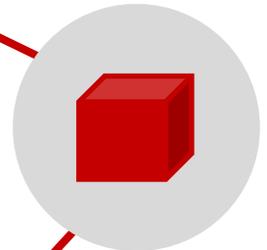
The requested transaction is broadcast to a p2p network of computers, known as nodes, and may be tied to a digital contract



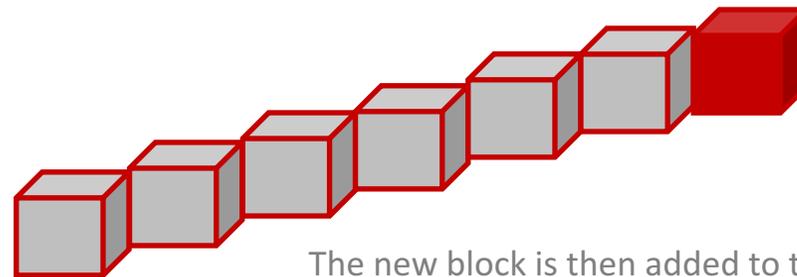
VALIDATION: The network of nodes validates the transaction and the user's status, using known algorithms



A verified transaction could involve registration, cloning, selling, or licensing, and may be a financial transaction



Once verified, the transaction is combined with other transactions to create a new block of data for the ledger

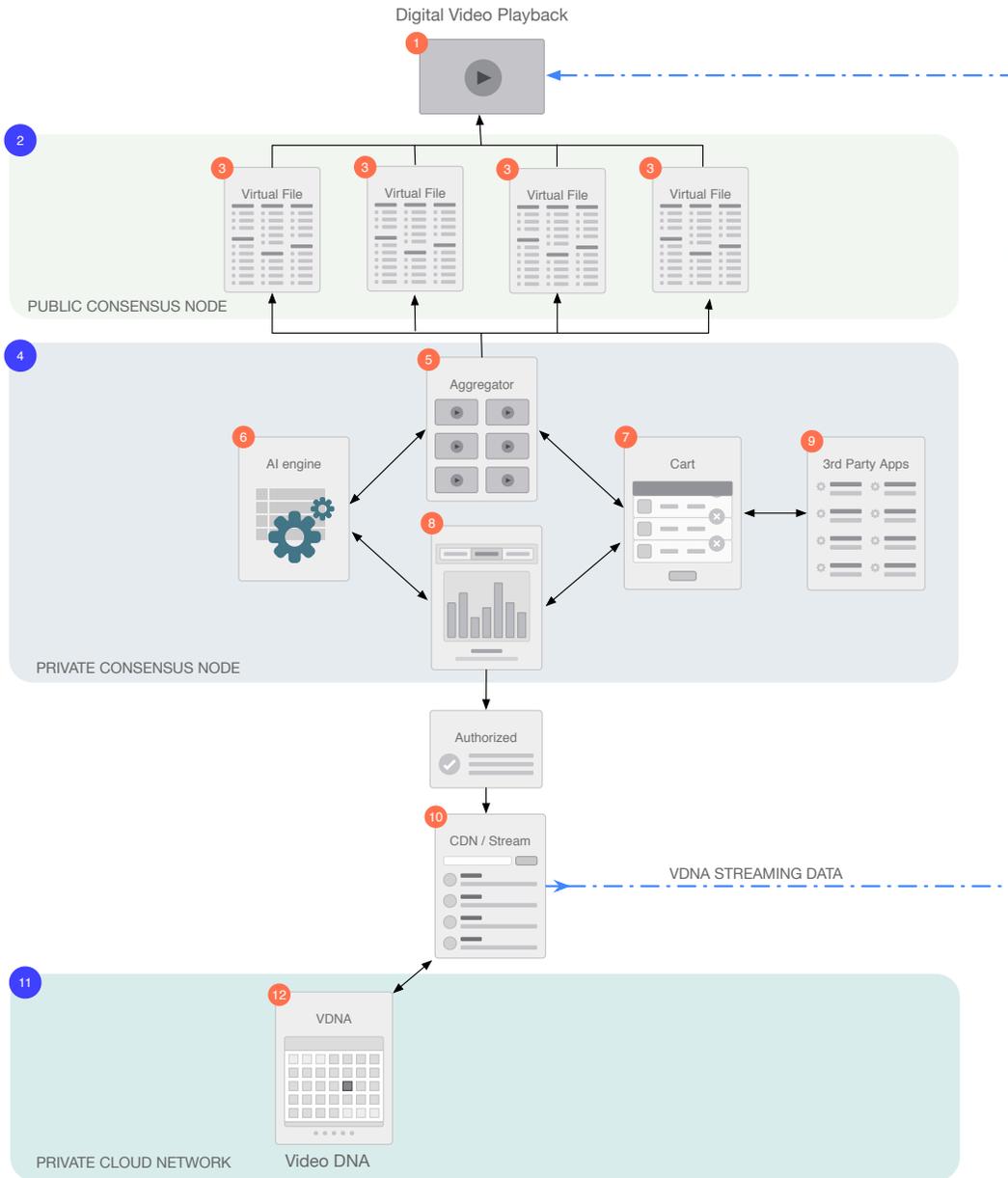


The new block is then added to the existing blockchain, in a way that is **permanent and un-alterable**



The transaction is complete, and the video can only be played under the terms of the contract

Extended Linius Blockchain Architecture



Content Blockchain Index

- 1 Video File Playback
- 2 Public Consensus Node
- 3 Virtual Files "Ledger" Distributed across Network nodes
- 4 Private Consensus Node
- 5 Aggregator / Distributor / Platform
- 6 AI engine (e.g. Watson, Deepmind)
- 7 Payment
- 8 Reporting / Analytics
- 9 3rd Party Apps (e.g. Bluemix / AWS)
- 10 CDN / Delivery Network
- 11 Controlled private cloud network
- 12 Secure VDNA

Notes

- 3 Virtual Video files "Ledgers" Contain transaction, Authorization and video frame sequences from single or multiple video files
- 12 VDNA is kept at a controlled location and delivered when the Content Blockchain reaches consensus. Virtual Video "ledger requests the VDNA on press of Play, and virtual video interprets incoming VDNA to play video. Separating the components of a video file into the blockchain and providing access only when the chain reaches consensus allows all the benefits of Blockchain security but with the added benefit of AI or data driven content programmability via the custom assemble of VDNA blocks or sequences.

The public Linius Blockchain can be integrated with either standard client-server applications, or private blockchains, to maintain security and monetization all the way from the camera to playout.

Smart contracts can be used between the private and public blockchains to ensure stakeholder rights in how the assets are distributed, cloned, and modified.

*Why is the Linius Blockchain
attractive to the market?*

- **No longer any risk of copying the files and letting someone else play them.** With the cryptographic keys underlying blockchain, each virtual video asset becomes unique. You can think of it like artwork. Each video is now an official copy; there's no longer any forgery, as authenticity of the virtual video is attested by the blockchain. Independent producers, and even major studios, need no longer worry about piracy.
- **All rights are guaranteed** since the virtual video player acts as your video library. When a user pays for an asset, they own that copy, and it's attested in the blockchain.
- **Smart contracts for video intellectual property sampling and additional stakeholder royalties.** With the power of virtual video to dynamically merge, splice, and manage content dynamically — whether by VJs, advertisers, or artificial intelligence — it becomes possible for all of the stakeholders to receive micro-payments, guaranteed in advance by digital contracts — when portions of their intellectual property are sampled or derivative works are created.

- **Middle-men in video distribution is radically reduced**, if not eliminated, enabling studios to disintermediate their own channels.
- **Stakeholders in a video are guaranteed to know their share of value** — actors, agents, producers, studios - everyone will have an audible trail of how many times a video has been played, and can even be instantly compensated at time of play based on digital contracts.
- **User-generated-content can be instantly monetized.** Instead of artists relying on YouTube payments or patron subscriptions, video producers can charge what they want for each view and receive payment instantly.

Video Virtualization makes a video blockchain possible

We believe the adoption of blockchain as a fundamental technology, combined with video virtualization, provides a way for Internet user to genuinely own and transfer video assets to other users, safely, securely, and in an auditable way, and that enabling this capability will accelerate our vision of making all the world's video accessible as data.

We are currently working with our global partners to establish the best execution path, and look forward to updating you in the future.





 Christopher Richardson, CEO

 info@linius.com

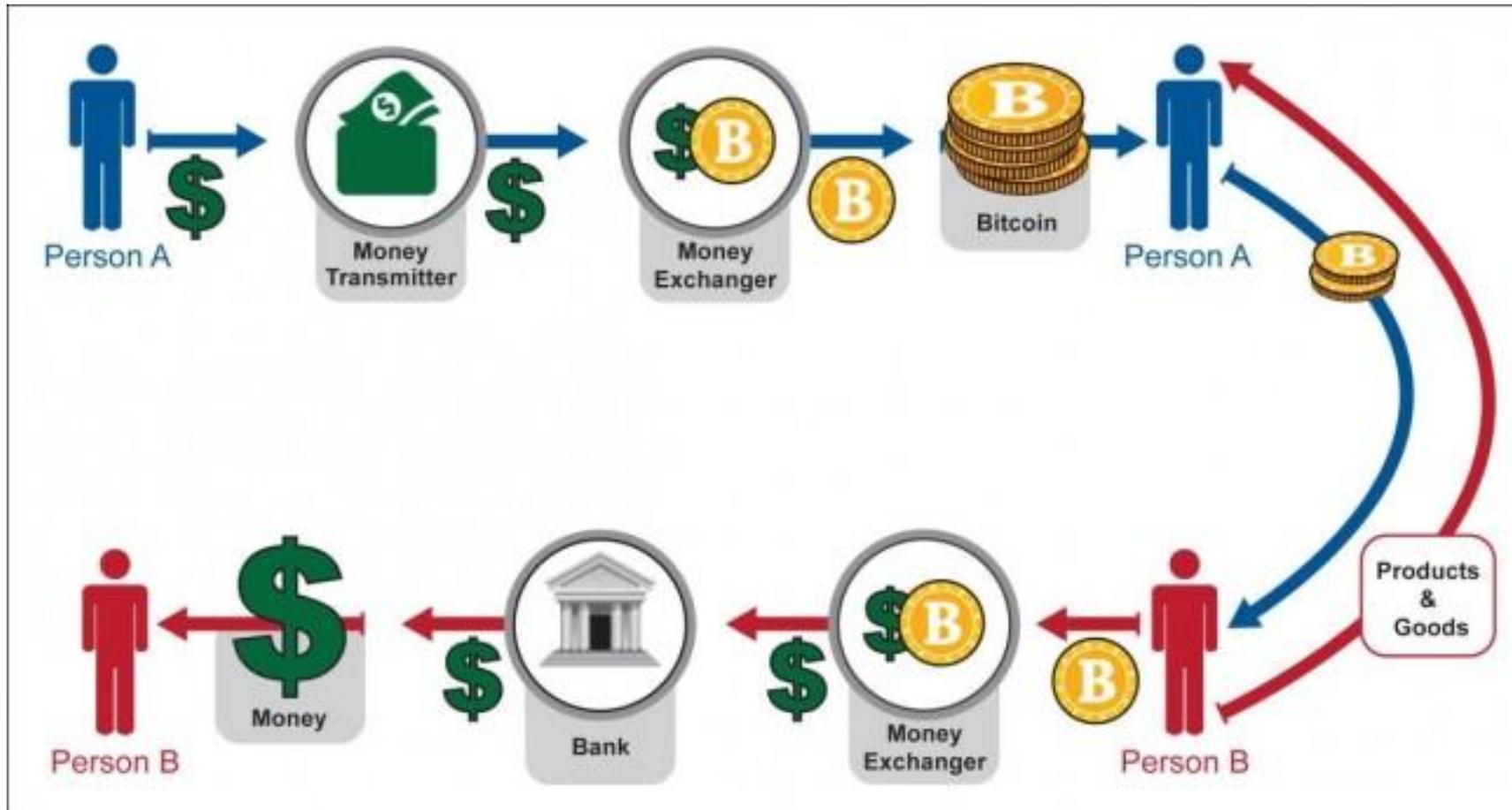
 +61 3 9607 8234

 Investors ir@linius.com

 Press and Media pr@linius.com

How Does Blockchain Work?

Example: Bitcoin is a Cryptocurrency



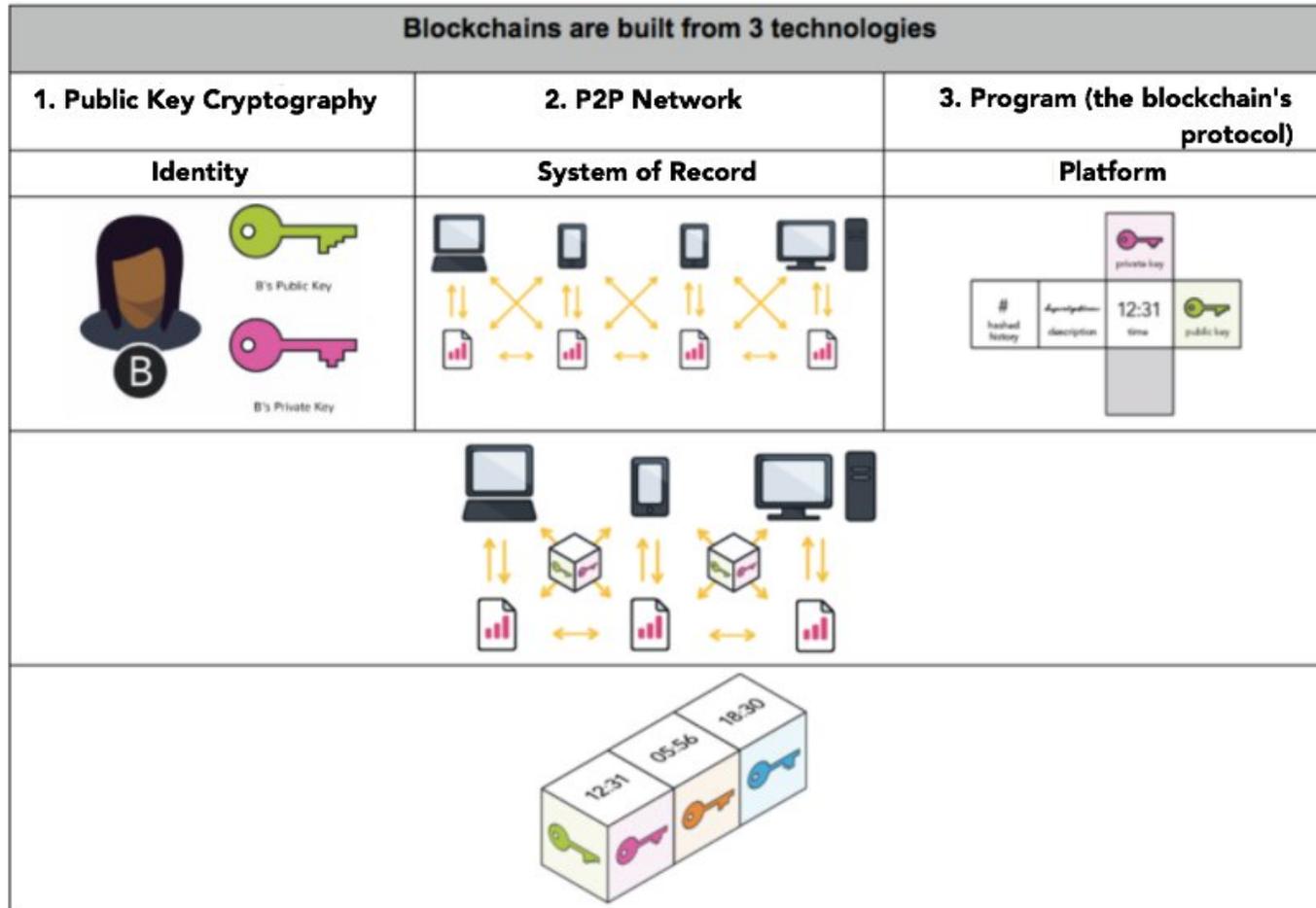
Think of it as "just" a foreign currency.

The big differences are:

- 1) it's digital only (you can't go withdraw it from a bank and hold on to "cash")
- 2) there are no trusted intermediaries to review transactions (no government, bank, etc...)



- If I give you cash, I don't have it anymore
- If I pay with a debit card, the digital version of my cash is moved by a trusted intermediary (my bank)
- But if there are no banks in the system, and there's no physical bit of paper that's not easily counterfeited, what's to stop me from spending the same Bitcoin more than once?
- This is the original problem that blockchain was designed to solve



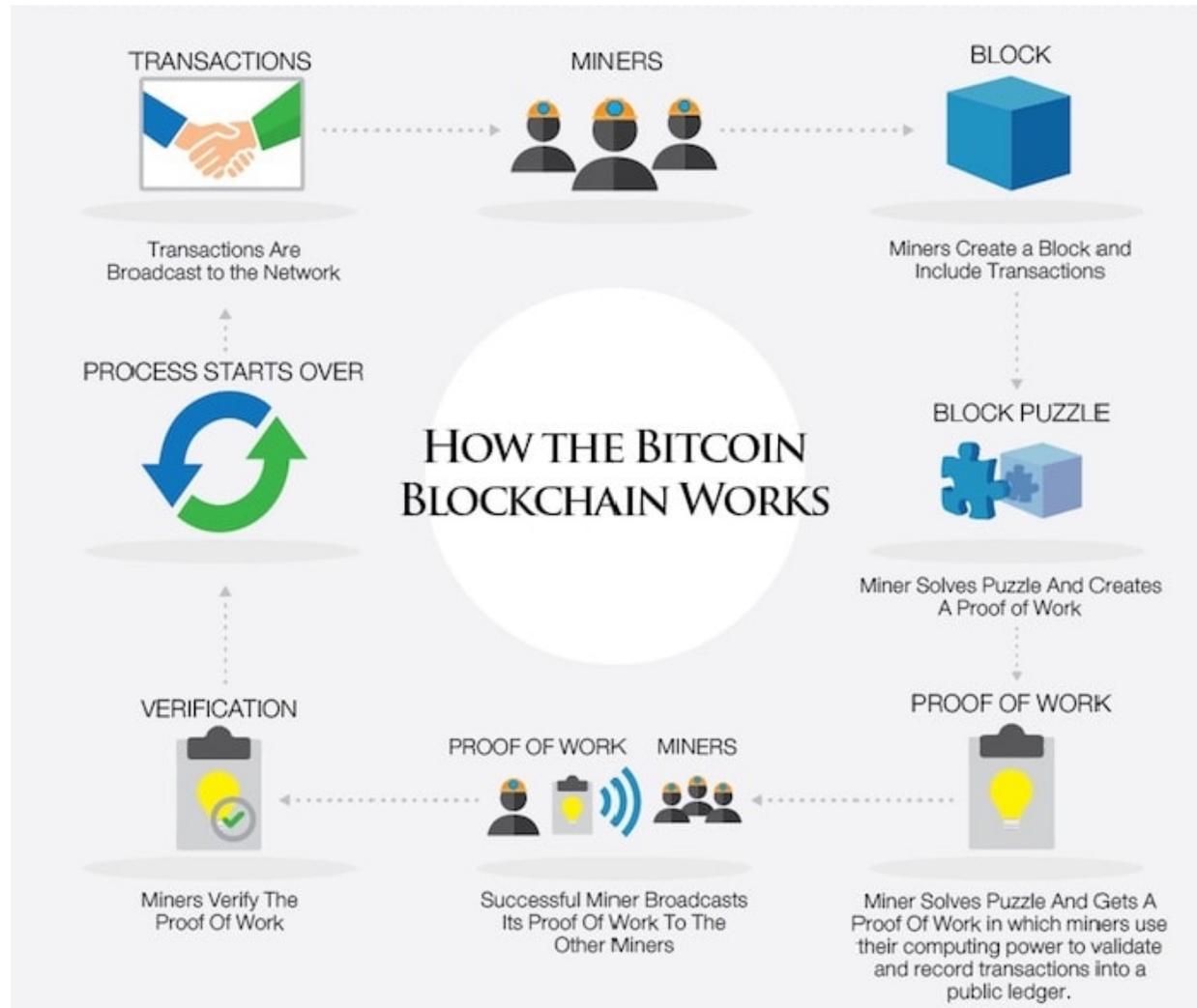
Blockchain uses public-key cryptography to prove your identity, anonymously.

It stores which user owns which digital asset (which bitcoins) in a distributed peer-to-peer network.

This network stores the entire history of all transactions in a chain of blocks, and guarantees their validity through a process called “proof of work”, which is done through “mining”.

You use a piece of software called a digital wallet to manage your cryptographic keys and make transactions.

How Mining Works



A Bitcoin Wallet

