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Copyright notice

CW-chain: A bulletproof, immutable, append-only copyright registration ledger

Alt: CopyrightsWorld's copyright registration formula explained

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Note: Toroblocks is a service by Copyrightsworld that utilizes the exact same CW-chain ledger and protection formula as described in this whitepaper. Also, this is an updated version of the original writepaper.

Abstract.

A copyright registration formula that can immediately provide strong, multiple and undeniable proof of ownership to anyone that applies it to its own creations. The formula connects the creator's digital id with his creation and the exact date and time the creator applied the formula to it (the creation) creating a Certificate of Ownership (CoO) as proof of their ownership. All this data is immutably recorded to a transparent, append-only ledger based on the **blockchain** technology. This blockchain, called "cw-chain", is **privately generated** and is **publicly available** to anyone and distributed to the IPFS network and Solana L1 blockchain. Recorded and stored data gets encrypted using the creator's public cryptographic key. Every read-only block on that chain can be easily verified by the "block verification" mechanism described below. Copyrightsworld provides the technology and the platform needed to accommodate such functionality.

1. Introduction The Berne convention

The **Berne convention** binds most of the world (currently 174 of 195 countries) under the basic principle that the beneficiary of any creation is the person capable of providing the strongest and earliest proof of ownership to that creation. Current registration mechanisms are mostly outdated, expensive, slow and in general fail to service that purpose in a sufficient way.
Utilising the latest technological trends, Copyrightsworld creates a mechanism "the formula", based on **blockchain-like technology**, that provides undeniable **proof issuing a Certificate of Ownership** (CoO) for its users. That formula will be discussed in this whitepaper.

Source:
(http://www.wipo.int/treaties/en/ip/berne/summary_berne.html)

2. Certificate of Ownership (CoO)

When a copyright claim comes to litigation, according to the copyright law the original creator of that creation should be able to undeniably prove that he was the owner of that work at a specific time in the past in order to be declared as the beneficiary of that work. Copyrightsworld's unique formula provides exactly that. Proof of Ownership.

The Certificate of Ownership (CoO) our platform provides certifies that a creator can prove that he submitted his work (so he was in possession of that work at that exact time) at a very precise day and time in the past. That is solid, undeniable proof of ownership, since that digital asset gets linked to its owner's digital account, encrypted, timestamped, distributed, digitally signed, and immutably recorded to our append only "cw-chain" ledger, making it impossible for anyone to alter that information (the proof) without compromising the integrity of the ledger.

3. Submitting a creation

Every registered user creates his digital identity within the Copyrightsworld / Toroblocks network. That identity consists of his name, email, a unique identifier (cwid), a digital signature, and a pair of private / public cryptographic keys. A user must be connected (logged in) in order to initiate the submission process.

The "creation submission" process starts when a user chooses the files he wants to submit to the system. This can be one or multiple files at once.

By clicking "Upload," the user activates the submission process.

At this stage, a very complicated process gets initiated. We can't go into detail about the process because of proprietary and security concerns, but here's what we can say publicly. Every creation gets uniquely identified with

the use of serial cryptographic algorithms, validated timestamps and other security processes. The creation gets undeniably linked to its owner's digital id and securely and encrypted stored.

We manage to be able to fully describe the creation publicly without the need to reveal the actual creation. Actual creations can be only accessible and decrypted by its owners and their private keys.

Finally, a submission receipt with all the information produced by the above process, is sent to the user's email address. That message gets timestamped by the mail service "third party" (eg. Gmail, Yahoo mail, Outlook etc.). That timestamp matches the records timestamp in CW-database.

That way, the user immediately holds all the information needed to prove the submission action in that specific day and time, time-stamped by Copyrightsworld and another third party (his email service provider).

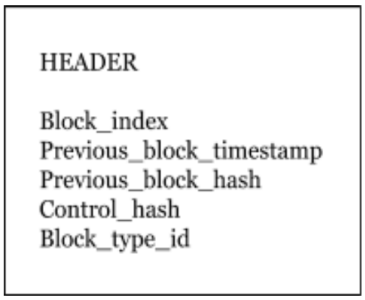
Copyrightsworld uses the SHA-256 hash of a digital file as a digital identifier for that asset. SHA-256 cryptographic hash function, takes an arbitrary amount of input data and deterministically produces a fixed-length output. That output is called a "hash." It can be used to easily verify that data has not been altered because if any part of the input data is changed and the hash algorithm runs again against that data, the hash completely changes.

4. The block

Each submission becomes a new block on the immutable, append-only Cw-chain. Each block consists of three parts. The block's index, the header and the body.

The block index is a "key". An auto increment number based on the previous block's index. So if the previous block's index is 5, the new block's index will be 6 (5+1) and so on.

Header structure

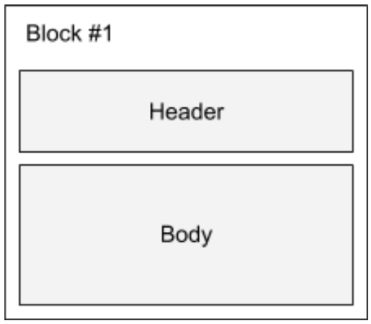


Most of the header values are self-explanatory. Below, we explain the rest in more detail.

Control_block_hash: The hashed value of the current chain-link session's control block. Block_type_id: Block types include "short text," "long text," "sound," "visual," "software," "control," and "blank." We record the IDs of those types in the block. Special blocks.

[The value of the control block is 100. The value of a blank block is [0 (zero)].

Body structure



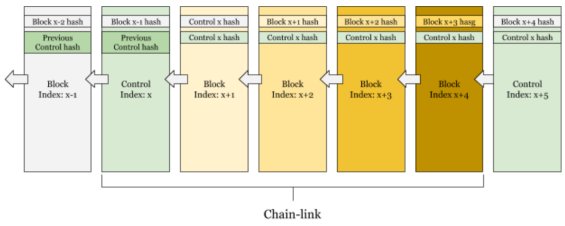
Most of the body values are self-explanatory. Below, we explain the rest in more detail. Ip_id: The id value assigned to this creation when it was recorded in the CW-database. Cwid: This is the unique identification number every user gets on registration. This connects his digital identity to all his actions within the network.

5. The Cw-chain and it's chain-links

Every new block that gets added to the chain references, in its header, the cryptographic hash of its previous block and the current chain-link session's control cryptographic hash. The cw-chain consists of a series of block groups called "chain-links".

A chain-link starts with a special block of type "Control" and ends just before another "Control" block occurs. This special block (control) is used to clearly define the start and end of a new chain-link.

Blank-blocks: These special, randomly generated blocks are used in order to avoid multiple "in-a-row" submissions from the same user.
That way, the system kills any attempt to "game" the block creation process of the chain.

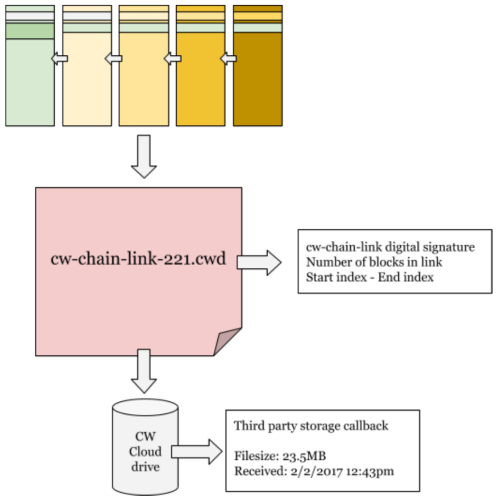


All block-based cryptographic hashes occur by hashing the block as a whole. There are no exceptions. That way, if any past block changes its data in any way, a new cryptographic hash will have occurred out of it, making the Cw-chain invalid since all "prevous_block_hash" values following that block will be false. That mechanism ensures the integrity of the chain as a whole.

6. Syncing the chain links

Every pre-specified time cycle (currently is 24h), a "Cw-chain sync" occurs automatically.

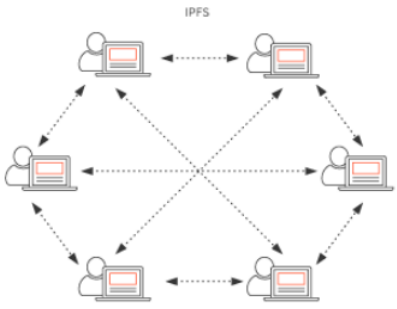
Here's what happens.



The chain will remain locked until the synchronization process is complete. A full, identical copy of the current chain-link at its current status is created as a separate file named "cw-chain-link-index", where index is

the auto-increment value of that link's position in the chain. A cryptographic hash of that file is generated and stored. The chain-link file gets pushed to third-party cloud storage and pinned to the IPFS network.

After the chain-link file gets pushed to that third party cloud storage service and the IPFS network, we get a callback with a filesize value, a timestamp value, and the IPFS hash of the file from the peer-to-peer network. These are strictly read-only values to our system and are controlled only by those third party services.



IPFS network architecture

The filename, its digital cryptographic hash and the callback values (size, timestamp, IPFS hash) are recorded in the cw-database.

Simultaneously, the hash value of the final cw-chainlink file, along with its direct hash link in the IPFS network, is stored as an NFT on the Solana L1 chain as an NFT. That way, CW-chain acts like a Solana sidechain and gets the distribution and decentralization of the Solana blockchain network for its own files, adding security and immutability to the mix.

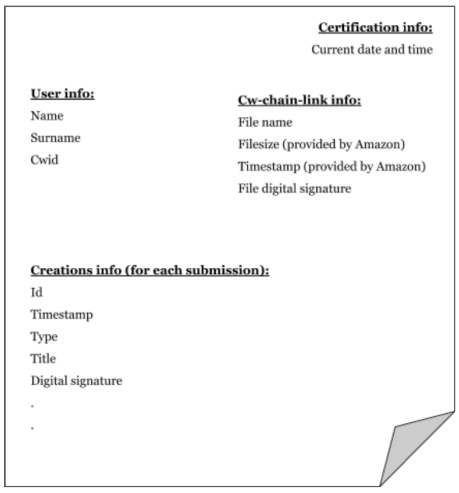
All chain-link files are publicly accessible to anyone via the IPFS network via the IPFS hashlink. So anyone can download and store the full Cw-chain (consisting of all the cw-chain-link files) in its current state.

7. Immutable certificates of ownership.

Bringing everything together

Immediately after a chain sync is completed, the "certificate generator" gets triggered. Immutable **Certificates of Ownership** (CoO) are automatically generated and emailed to every user that has submitted at least one creation within that "chain-link" session. This Certificate of Ownership has all the information and details that came out of the sync process.

Some of the data included in every Certificate of Ownership:



Again, every certificate gets timestamped by a third-party email service provider on arrival.

For each file submitted during that time, the person who sent it gets a separate Certificate of Ownership. That certificate includes all the information produced by the chain-sync process.

8. Creating consensus

Every record, digital hash, file size value and timestamp (the output), is contributed by third parties and propagated to our users, creating **a network effect**. All those different and complex generated values land in the user's mailbox at the end of every chain sync. That way, the user has all the information he needs to prove his actions in any case, and that information must agree with the cw-chain data in order to be valid. Also, the cw-chain is **publicly available** to anyone at anytime and can be locally stored.

9. Verifying the chain

There are two ways to verify the chain. A **full chain verification** and a **chain-link verification**. When full chain verification

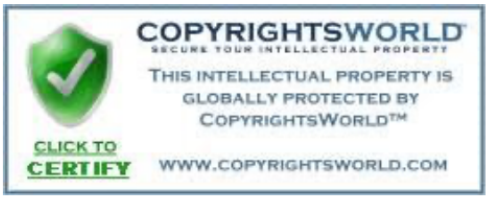
occurs, the system will pull all cw-chain-link files and generate the full cw-chain out of them. Another cw-chain will be recreated using the original records stored in its cw-databases. If those two chains are identical, then the cw-chain passes the verification process successfully and is considered to be verified and in a healthy status.

Partial verification can occur in a random manner. A random index number is generated, and the cw-chain file matching that number is pulled for checking. The above process is then executed, but just for that cw-chain session.

10. Verification badges

When a chain-sync has been completed and every creation has been successfully recorded in the cw-chain, a verification badge can be obtained. That badge can accompany every public screening of a creation, visually verifying the registration of that asset to the append-only ledger. By clicking that badge, a viewer will be transferred to a verification page where the Certificate of Ownership is verified and the creation's metadata, timestamp, digital signature, and ownership information get displayed. A CopyrightsWorld or Toroblocks Verification Badge verifies that each submission and record in the CW-chain has been properly attributed.

Sample verification badges.



Sample verification badge

11. A bulletproof chain

As mentioned above, CW-chain is a transparent, append-only ledger in the form of a chain. Since this is a privately

generated chain, we needed a mechanism to secure its integrity by decentralizing the actual data from the system that created it.

We accomplish that by sharing the chain with third parties, the IPFS network, and the Solana L1 blockchain, getting feedback that we can't control but fully describes the current status of the chain (such as file size, digital signature, IPFS hash, Solana NFT address, and timestamp), and sharing all that information immediately and directly with every user via multiple third-party email service providers.

In other words, if we wanted to change anything that has been recorded in the cw-chain, we would have to change the records in our databases, regenerate every Cw-chain-link, upload the files to every third-party cloud storage, hack its filesize and timestamp values (on every cloud storage service provider), hack the IPFS network and all its nodes, hack the Solana blockchain and all its nodes, hack the user's email account, and hack the third-party email service provider in order to change the certificate of ownership and all other interconnected values. All of this assumes that no user has a backup of the CW-chain or his certificate of ownership. Moreover, the digital signatures of the creations secure the data integrity since those signatures (hashes) are recorded in the chain and mentioned in the certificates of ownership all users receive. Any data alteration would change those values, making the submission inconsistent and breaking the chain's integrity.

As a result, this formula makes it impossible for anyone, even us who run the initial service behind it, to alter any data once it has been added to the chain and a chain-sync has occurred.

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Certificate of Ownership for this whitepaper.

23-01-2023

toroblocks.

Submission Receipt

Beneficiary
Georgios Efstratiadis

Submission details
Protocol Number: #86040
Submission Date: 2023-01-23 07:54:10
Digital Signature
fd9697bd1fc4f9b47d10e577ac9374ec787eea156a771c4c56e46ecfcd48beb6

Asset Details
Asset Name: 1_xaYbAoumyCDeKtp.pdf
File source: Local
Year of Creation: 2023
Edition: 1
Type of Asset: Short text
File Size of Asset: 714.81kB

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