BLOCKCHAIN & LAND REGISTRY

Philippe Thevoz
Executive Vice-President
eGovernment Systems

SICPA

Enabling trust

Keeping track of who owns what pieces of land is still a low-tech affair, involving mountains of hand-signed documents, envelopes, and couriers. That is, if a country is lucky enough to have a functioning land registry—the World Bank estimates that 70% of the world's population lacks access to land titling. Getting everyone to agree on every stage of a property transaction, and to record it permanently somewhere, is a feat of security, coordination, and trust.

http://bit.ly/2nvTgtw

LAND REGISTRY & BLOCKCHAIN

Sweden is trialling a blockchain-powered land registry – which could save taxpayers $100 million

Tom Turula | 04 Apr 2017 10:37 AM | 1000

http://read.bi/2r5Z0M9

UK Land Registry Plans to Test Blockchain in Digital Push

May 12, 2017 by Stan Higgins

Use Cases & Verticals • News • Distributed Ledger Technology

The UK's national land registry is looking to test blockchain technology as part of a wide-ranging digitization effort.

Last month, HM Land Registry began searching for new board members and, in a notice published to its website, also detailed its plans for a so-called 'Digital Street' – an upcoming scheme the office hopes will improve the speed and efficiency by which titles change hands.

http://bit.ly/2pFS1Kc

LAND REGISTRY & BLOCKCHAIN

BRAVE NEWCOIN.
Digital Currency Insights

Ukraine to use blockchain technology in curtailing corruption when selling government assets

Luke Parker, 10 Jul 2016 - Adoption, Blockchain, Ukraine

http://bit.ly/2ervuO8

Bitland: Blockchain Land Registry Against 'Corrupt Government'

By *Jamie Redman* - May 26, 2016 4970 1

A new project piloted in West Africa, called Bitland, is using blockchain technology as a decentralized land registry.

http://bit.ly/2e5s98X

LAND REGISTRY & BLOCKCHAIN

The First Government To Secure Land Titles On The Bitcoin Blockchain Expands Project

Laura Shin, CONTRIBUTOR

FULL BIO

Opinions expressed by Forbes Contributors are their own.

Georgia

In a vote of confidence for a fledgling technology, the Republic of Georgia committed in a signing ceremony in Tbilisi on Tuesday to use the bitcoin network to validate property-related government transactions.

http://bit.ly/2r20Liz

TECHNOLOGY NEWS | Fri May 15, 2015 | 9:57pm IST

Honduras to build land title registry using bitcoin technology

http://reut.rs/2q1a3a7

eGOVERNMENT

Dubai Wants All Government Documents on Blockchain By 2020

Michael del Castillo (@DelRayMan) | Published on October 5, 2016 at 16:40 BST

934 686 58

The Crown Prince of Dubai announced a strategic plan today that would see all government documents secured on a blockchain by 2020.

Revealed at an event hosted by the Dubai Future Foundation and the Smart Dubai Office, the final goal of the government-led initiative is to open the blockchain platform to other cities around the world.

In remarks, Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum explained the effort is part of a larger bid by the emirate, one of seven in th larger UAE, to set the "standard" for smart cities.

He said:

> *"The emirate is building on that achievement by constantly working to foresee the future and keep up with the fourth industrial revolution and all the prospects of increased efficiency that come along with it."*

GOVINSIDER

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CONNECTED DIGITAL INCLUSIVE INNOVATION SECURITY SMART EVENTS ABOUT

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Dubai to move all government documents onto Blockchain

It could unlock 25 million hours of economic productivity, announces Crown Prince.

By Charlene Chin

7 OCT 2016

CONNECTED GOV

http://bit.ly/2eNxVs1

eGOVERNMENT & BLOCKCHAIN - SYNERGIES

Nine in Ten Governments Investing in Blockchain by 2018 Says IBM Study

By **Richard Kastelein** - February 2, 2017 345

J'aime 24 Tweet

Executive summary

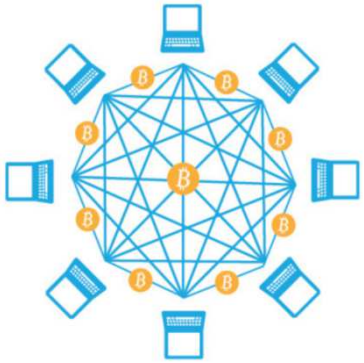
According to our recent blockchain research, government organizations across the globe are exploring use cases for blockchains that can impact their jurisdictions. With the support of the Economist Intelligence Unit, the IBM Institute for Business Value surveyed 200 government leaders in 16 countries on their experiences and expectations with blockchains.

Our research revealed that government organizations are looking at how blockchain technology can positively impact operations in a number of areas. For example, nine in ten government organizations plan to invest in blockchain for use in financial transaction management, asset management, contract management and regulatory compliance by 2018. And seven in ten government executives predict blockchain will significantly disrupt the area of contract management, which is often the intersection of the public and private sectors.


SICPA
BLOCKCHAIN AND SECURE TECHNOLOGIES

THE BLOCKCHAIN IN A FEW WORDS

The **blockchain** is :



- a ledger

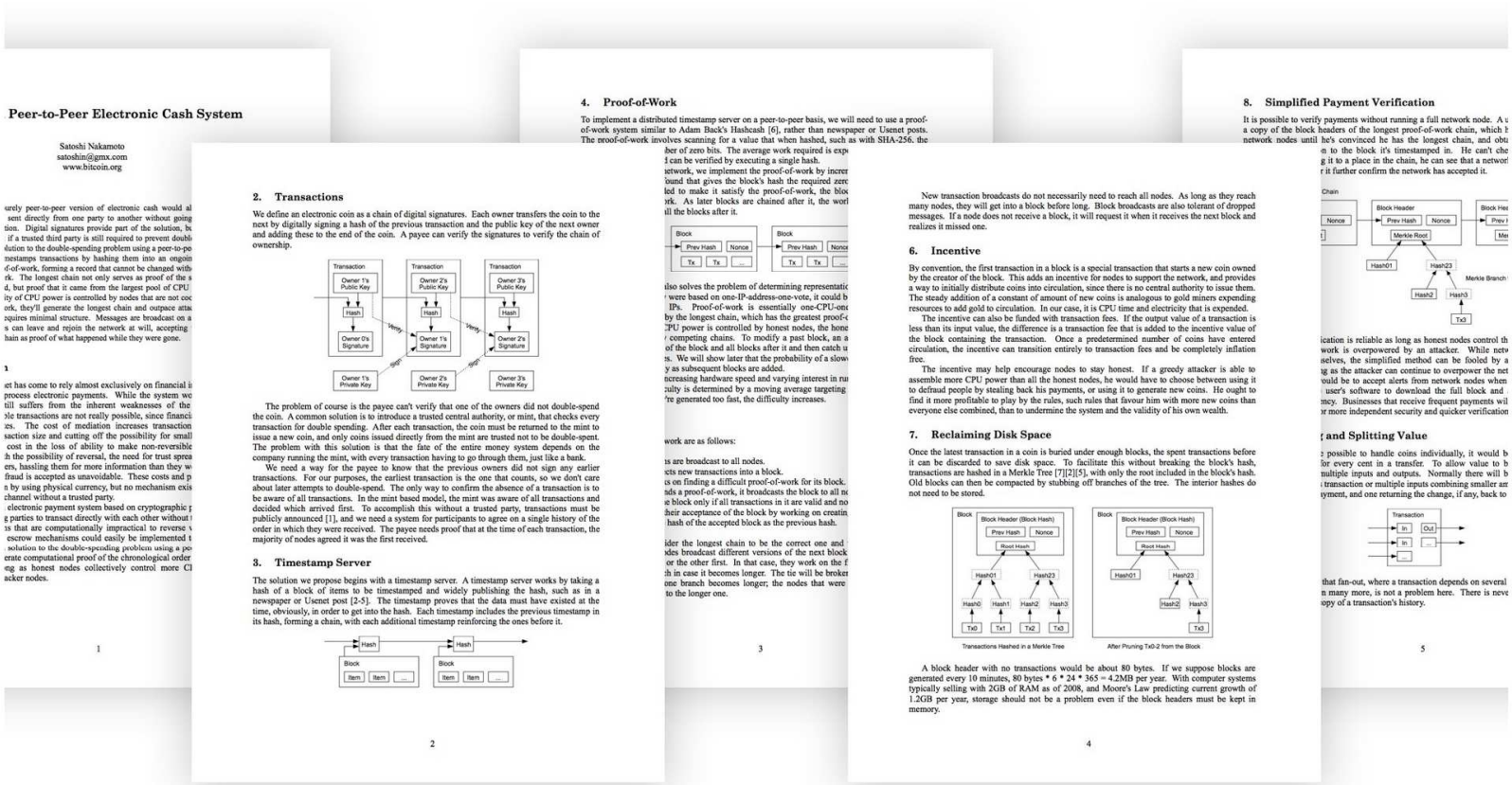
that is

- distributed,
- cryptographically secure

and

- immutable

ORIGINAL PAPER FROM SATOSHI NAKAMOTO – OCT. 31, 2008



Peer-to-Peer Electronic Cash System

Satoshi Nakamoto
satoshin@gmx.com
www.bitcoin.org

2. Transactions

We define an electronic coin as a chain of digital signatures. Each owner transfers the coin to the next by digitally signing a hash of the previous transaction and the public key of the next owner and adding these to the end of the coin. A payee can verify the signatures to verify the chain of ownership.

The problem of course is the payee can't verify that one of the owners did not double-spend the coin. A common solution is to introduce a trusted central authority, or mint, that checks every transaction for double spending. After each transaction, the coin must be returned to the mint to issue a new coin, and only coins issued directly from the mint are trusted not to be double-spent. The problem with this solution is that the fate of the entire money system depends on the company running the mint, with every transaction having to go through them, just like a bank.

We need a way for the payee to know that the previous owners did not sign any earlier transactions. For our purposes, the earliest transaction is the one that counts, so we don't care about later attempts to double-spend. The only way to confirm the absence of a transaction is to be aware of all transactions. In the mint based model, the mint was aware of all transactions and decided which arrived first. To accomplish this without a trusted party, transactions must be publicly announced [1], and we need a system for participants to agree on a single history of the order in which they were received. The payee needs proof that at the time of each transaction, the majority of nodes agreed it was the first received.

3. Timestamp Server

The solution we propose begins with a timestamp server. A timestamp server works by taking a hash of a block of items to be timestamped and widely publishing the hash, such as in a newspaper or Usenet post [2-5]. The timestamp proves that the data must have existed at the time, obviously, in order to get into the hash. Each timestamp includes the previous timestamp in its hash, forming a chain, with each additional timestamp reinforcing the ones before it.

4. Proof-of-Work

6. Incentive

By convention, the first transaction in a block is a special transaction that starts a new coin owned by the creator of the block. This adds an incentive for nodes to support the network, and provides a way to initially distribute coins into circulation, since there is no central authority to issue them. The steady addition of a constant of amount of new coins is analogous to gold miners expending resources to add gold to circulation. In our case, it is CPU time and electricity that is expended.

The incentive can also be funded with transaction fees. If the output value of a transaction is less than its input value, the difference is a transaction fee that is added to the incentive value of the block containing the transaction. Once a predetermined number of coins have entered circulation, the incentive can transition entirely to transaction fees and be completely inflation free.

The incentive may help encourage nodes to stay honest. If a greedy attacker is able to assemble more CPU power than all the honest nodes, he would have to choose between using it to defraud people by stealing back his payments, or using it to generate new coins. He ought to find it more profitable to play by the rules, such rules that favour him with more new coins than everyone else combined, than to undermine the system and the validity of his own wealth.

7. Reclaiming Disk Space

Once the latest transaction in a coin is buried under enough blocks, the spent transactions before it can be discarded to save disk space. To facilitate this without breaking the block's hash, transactions are hashed in a Merkle Tree [7][2][5], with only the root included in the block's hash. Old blocks can then be compacted by stubbing off branches of the tree. The interior hashes do not need to be stored.

A block header with no transactions would be about 80 bytes. If we suppose blocks are generated every 10 minutes, 80 bytes * 6 * 24 * 365 = 4.2MB per year. With computer systems typically selling with 2GB of RAM as of 2008, and Moore's Law predicting current growth of 1.2GB per year, storage should not be a problem even if the block headers must be kept in memory.

8. Simplified Payment Verification

and Splitting Value

https://bitcoin.org/bitcoin.pdf

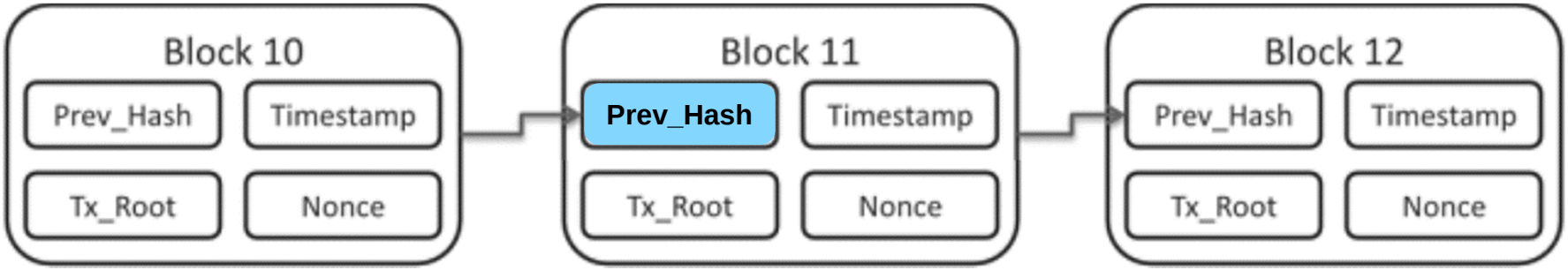
DIGITAL FINGERPRINT – SHA256 ALGORITHM

SHA-256

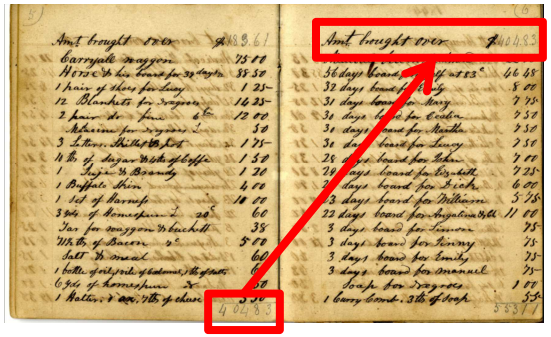
~~94dfbabefc05247d1f5e3d2f2362be2f08d08334295ee9f1b5577339fb9822e9~~

1ec3cc7497ee0fed85a095775a7e6bf2ada83da6e5c0d127eb9abd9aaeaf00b4

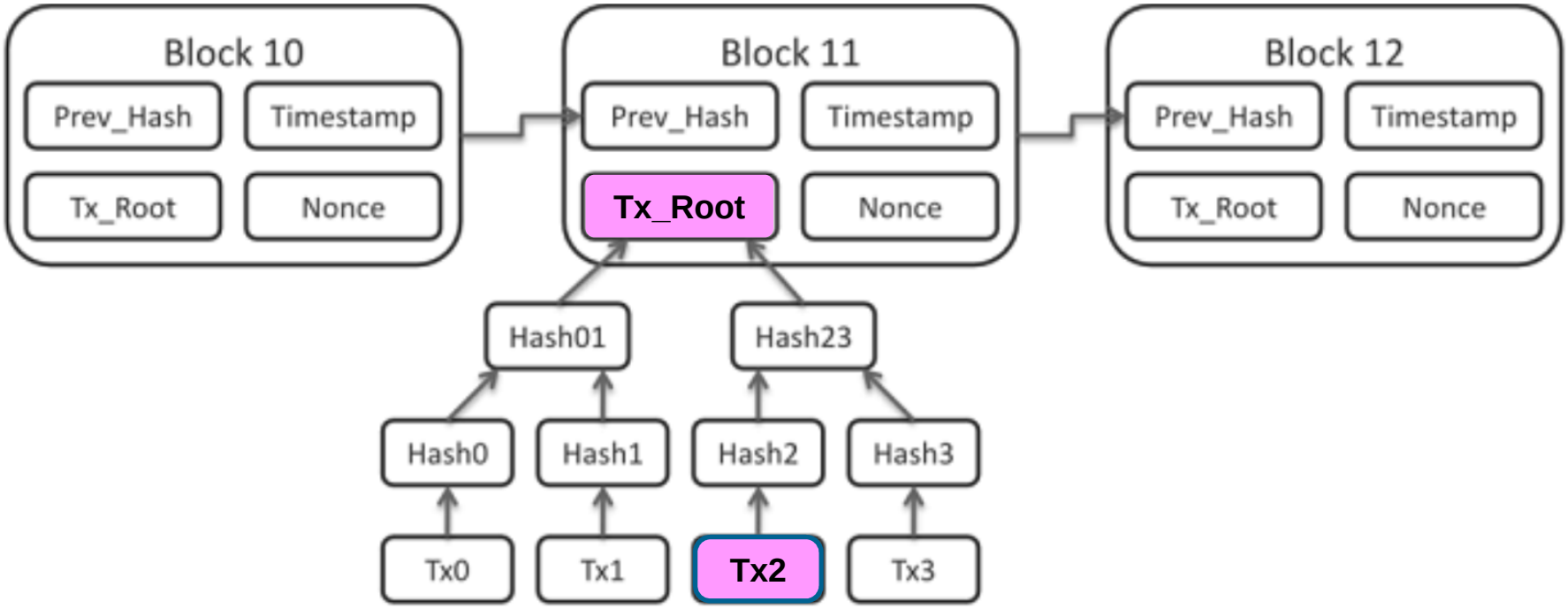
BLOCKCHAIN STRUCTURE



THE CHAIN PRINCIPLE



TRANSACTION IN THE BLOCKCHAIN

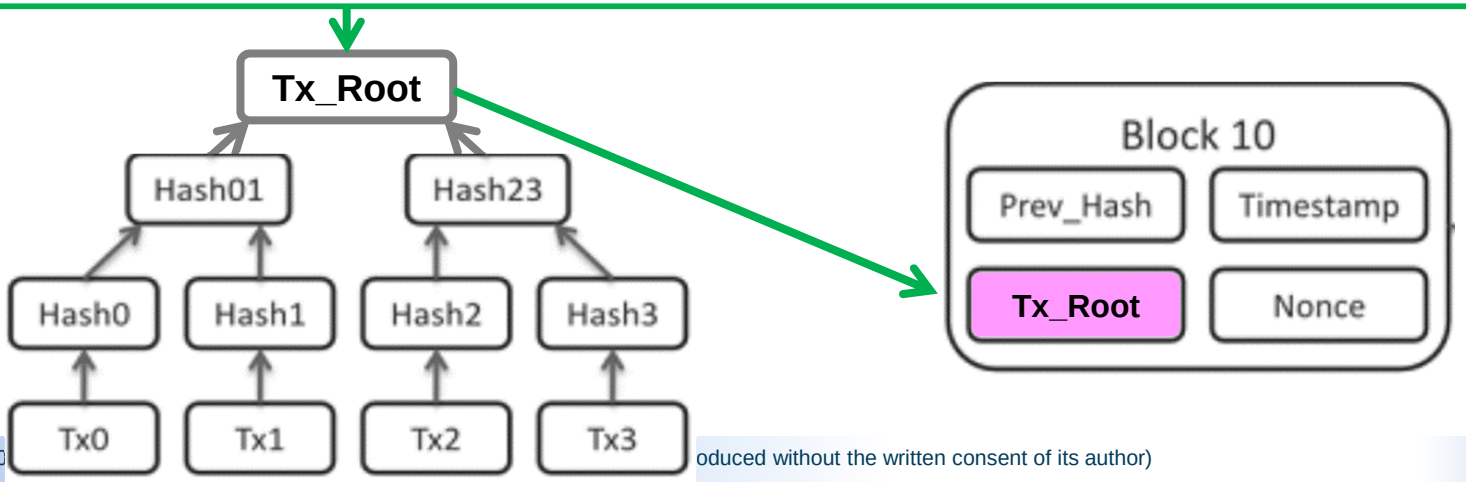


TRANSACTIONS - MERKEL TREE

```
Tx0 -> Hash0 : a7af08b04d86df90104c1cb52988e105f8b0c5e41afcb49dbb624928c23ceed7
Tx1 -> Hash1 : 55f743d0d1b9bd86bbd96a46ba4272ddde19f09e3f6e47832e34bb2779a120b5
Tx2 -> Hash2 : 80ed43f7a11b3295850dd90cc0cfc9a80334f433af8d3d88a1c5e78aff14988f
Tx3 -> Hash3 : 13288c2ba4bbc9af05aa9ccd39b0cc603dc9e30471d97565c9ef3c3604b7ca23

Hash01       : b88ef7a07b91cc4d9d6b81a1b17e4f08b31185bed41d71fe6036d2be55945984
Hash23       : 46a920ea0df1972748e87d3cf74759a9f94d4f65a6260531a3b85064e86b814d

Tx_Root      : 561e964c28335b1c99255d0f80cccc9025789c087e5d388247fef9275f1cbeb1
```

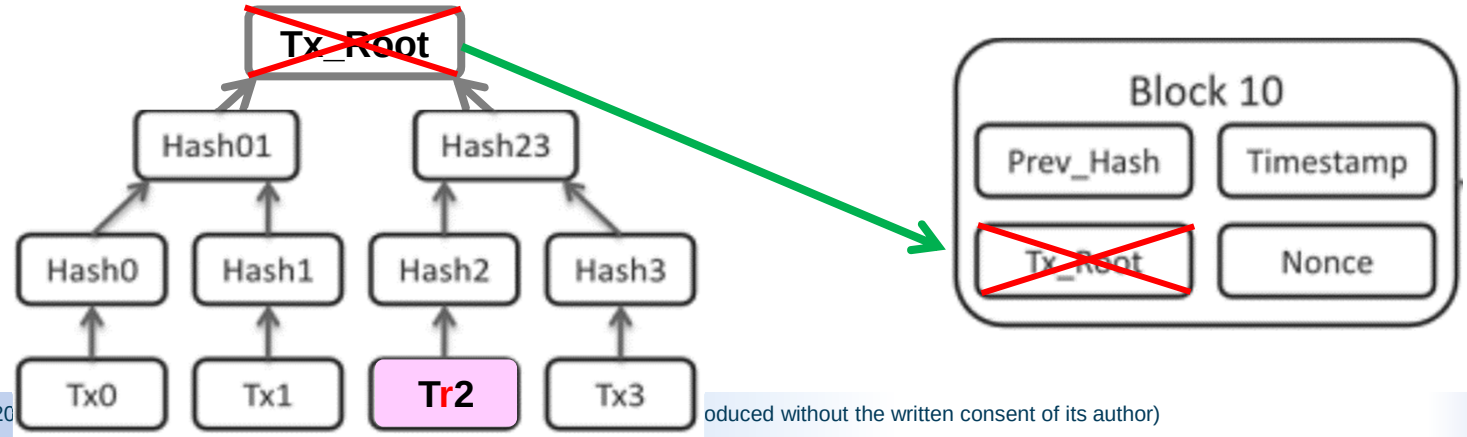


TRANSACTIONS - MERKEL TREE

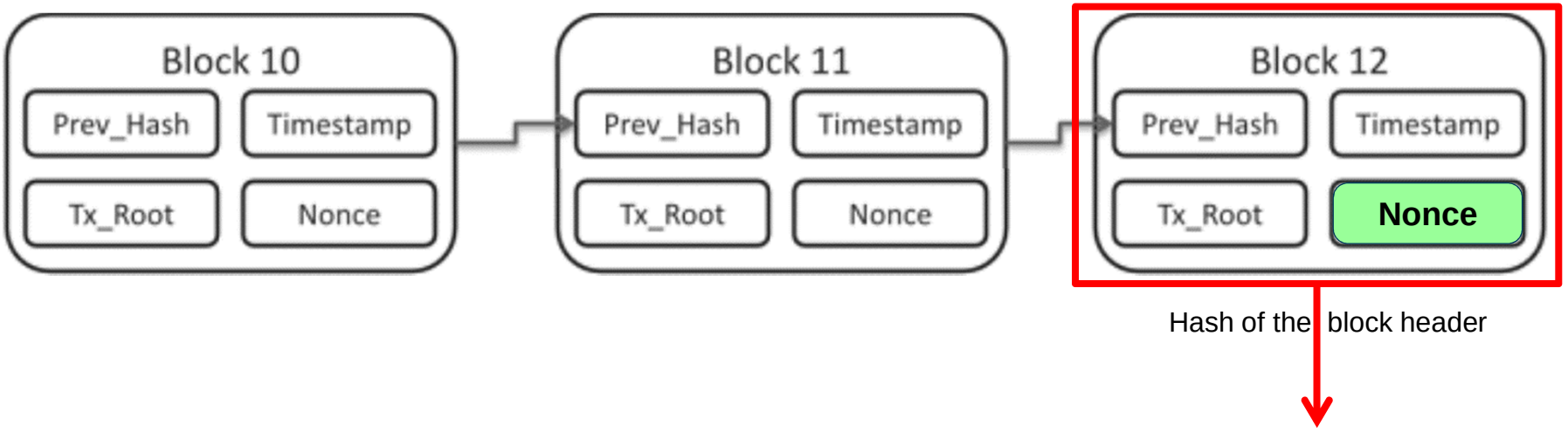
```
Tx0 -> Hash0 : a7af08b04d86df90104c1cb52988e105f8b0c5e41afcb49dbb624928c23ceed7
Tx1 -> Hash1 : 55f743d0d1b9bd86bbd96a46ba4272ddde19f09e3f6e47832e34bb2779a120b5
Tr2 -> Hash2 : 31b6be0266a8be6c1570e7ae79e13b1f2339c12723be2d9bfba1cb9bf6e753be
Tx3 -> Hash3 : 13288c2ba4bbc9af05aa9ccd39b0cc603dc9e30471d97565c9ef3c3604b7ca23

Hash01       : b88ef7a07b91cc4d9d6b81a1b17e4f08b31185bed41d71fe6036d2be55945984
Hash23       : 8e48fa97e0d8a00e78363e9080befa5dda1e3f1b6aa192bfc8b5aee76aa6ec11

Tx_Root      : d92eed688f508d916946afcb49c9afa0d7e05e6098e51a80385d0ef411a9e4f6
```



BLOCK VALIDATION – PROOF OF WORK (POW)



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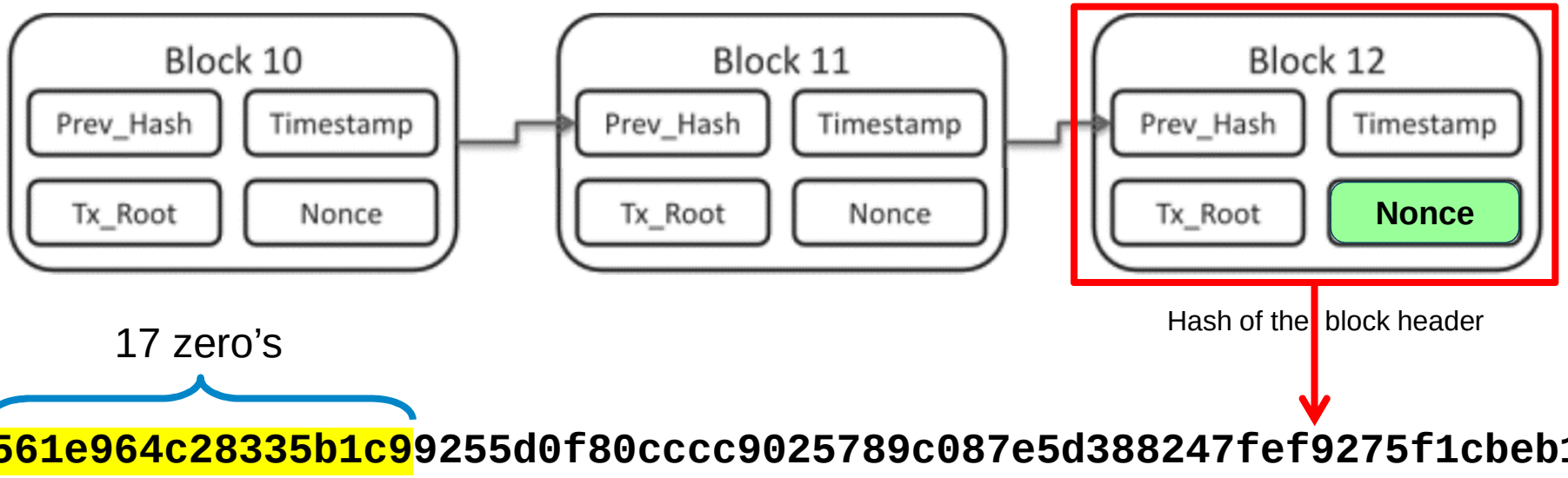
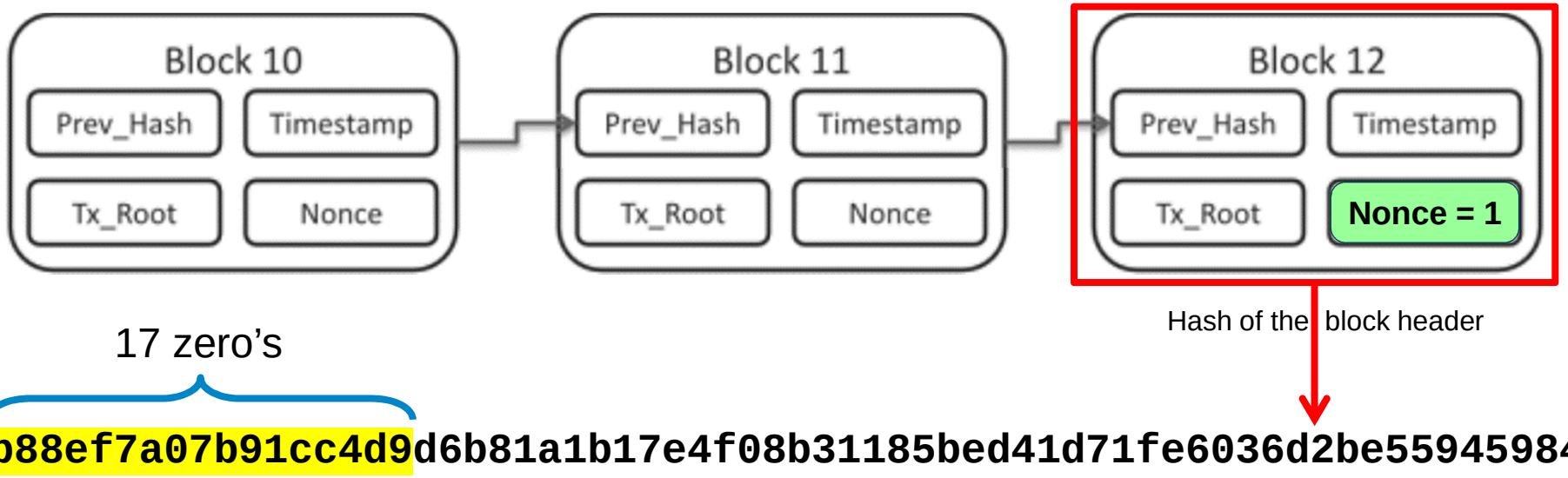
BLOCK VALIDATION – PROOF OF WORK (POW)

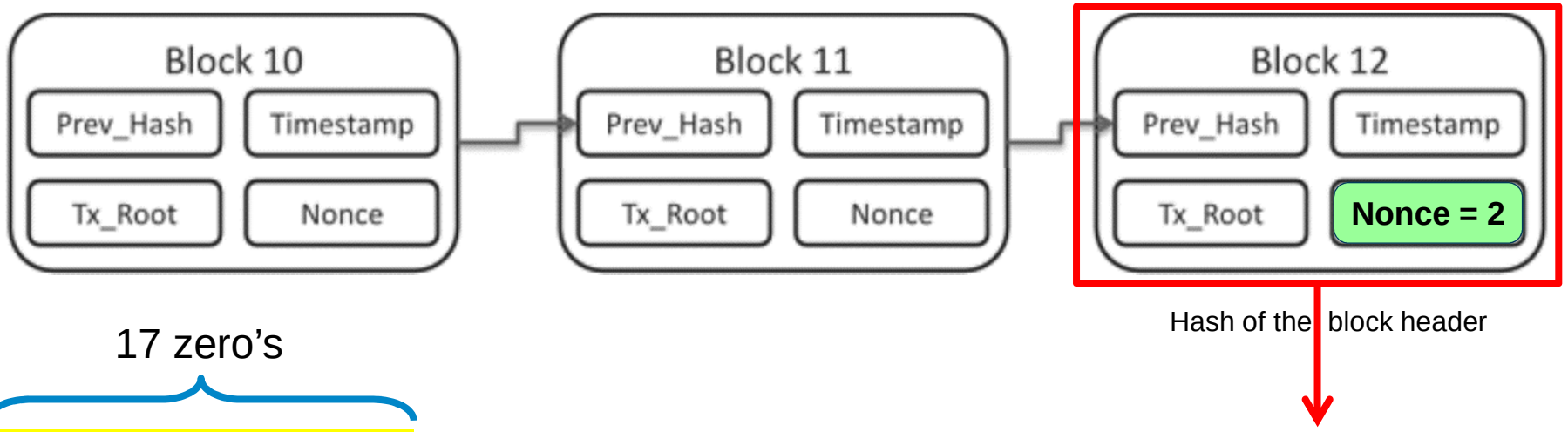


BLOCK VALIDATION – PROOF OF WORK (POW)



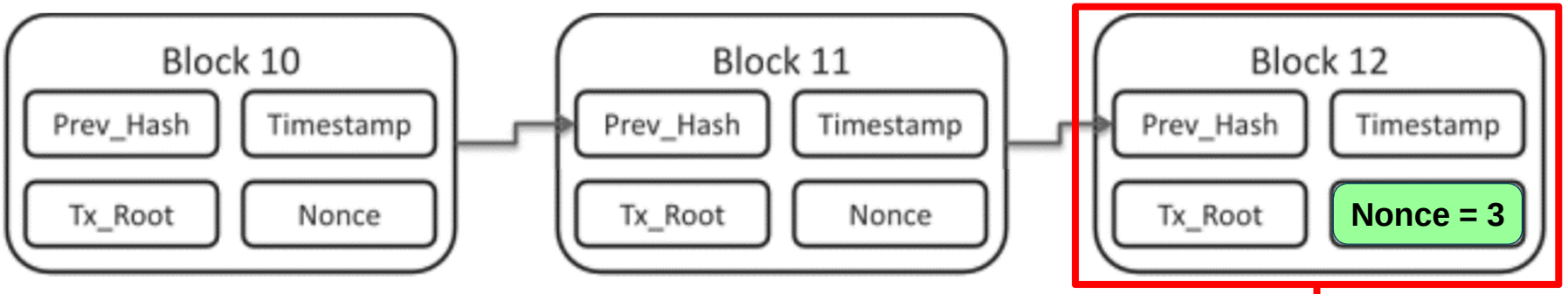
Nonce = 1

BLOCK VALIDATION – PROOF OF WORK (POW)



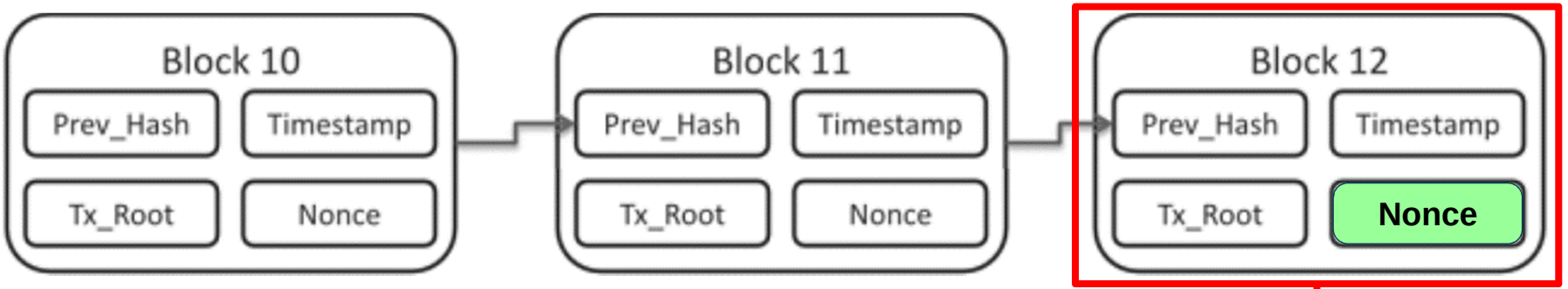
Nonce = 2

BLOCK VALIDATION – PROOF OF WORK (POW)



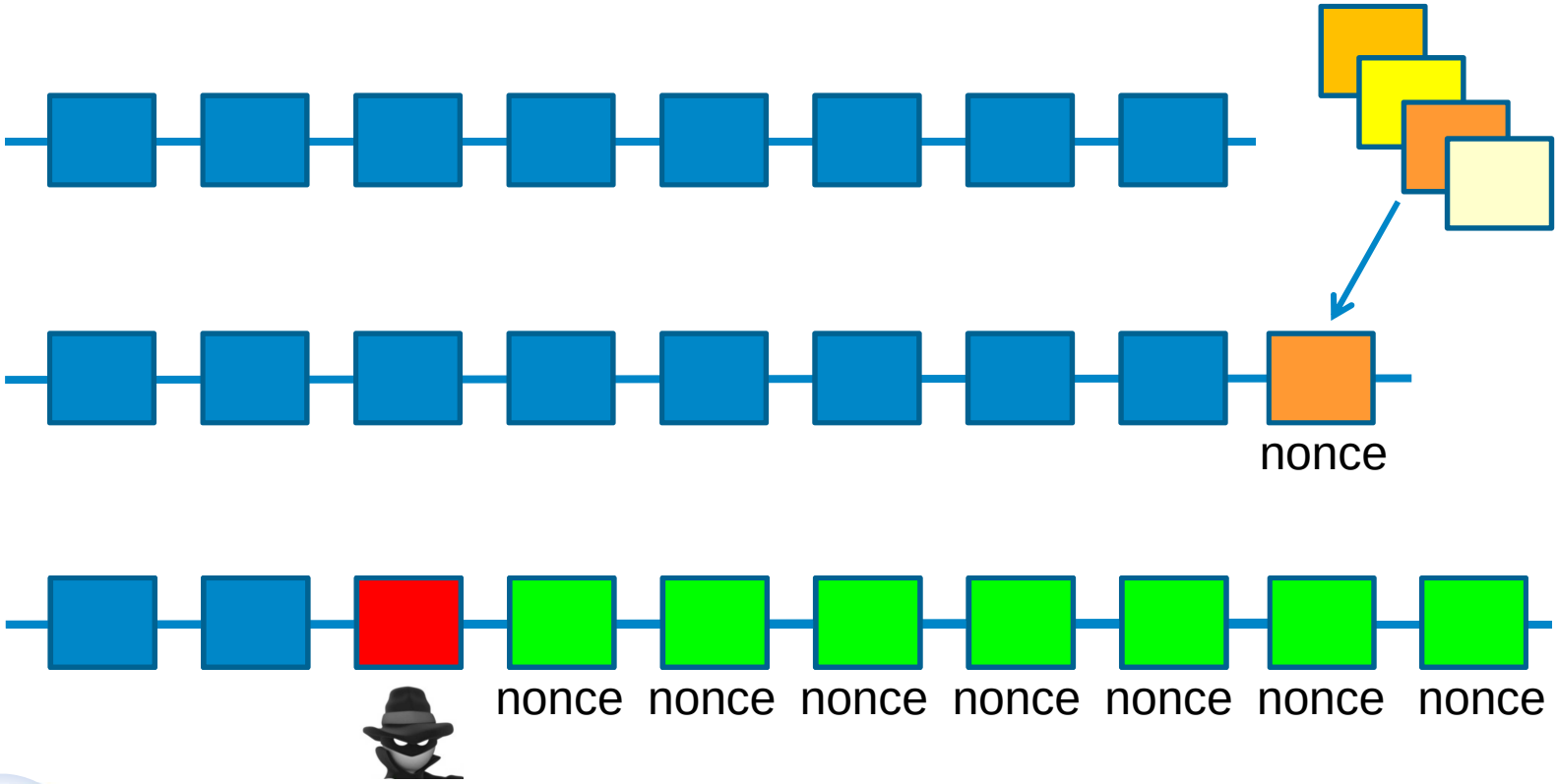
Nonce = 3

BLOCK VALIDATION – PROOF OF WORK (POW)



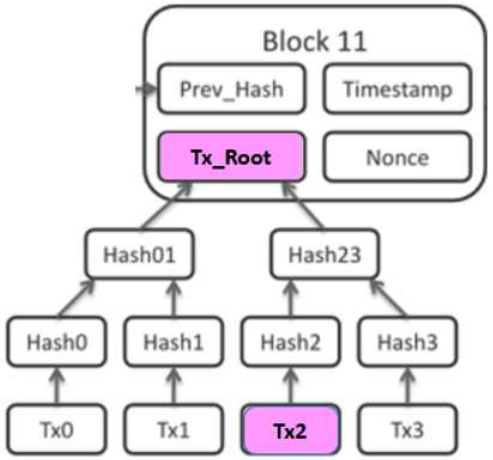
Nonce = 2'289'308'096

CONSENSUS & BLOCK VALIDATION



TRANSACTIONS

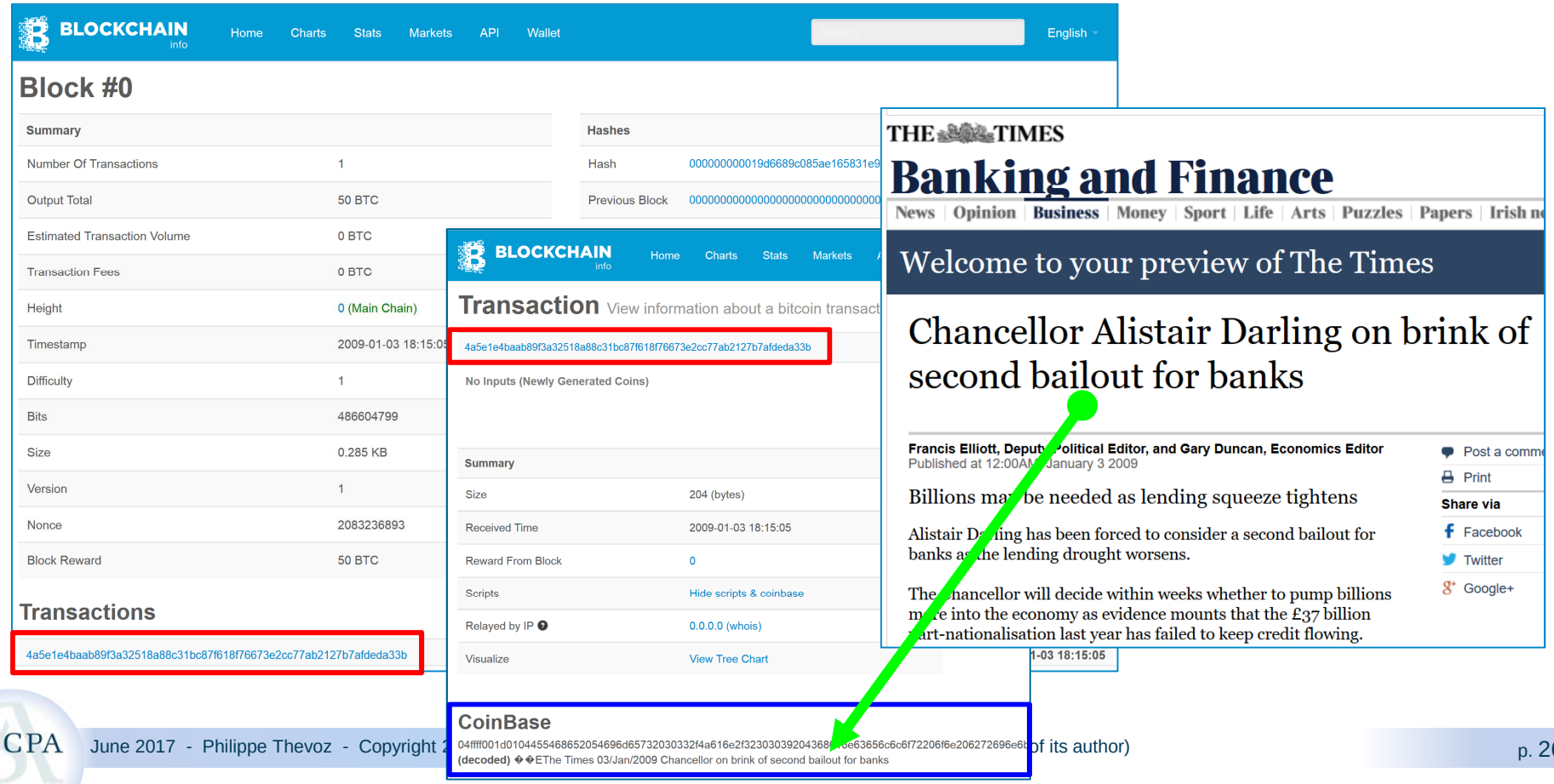
TRANSACTIONS



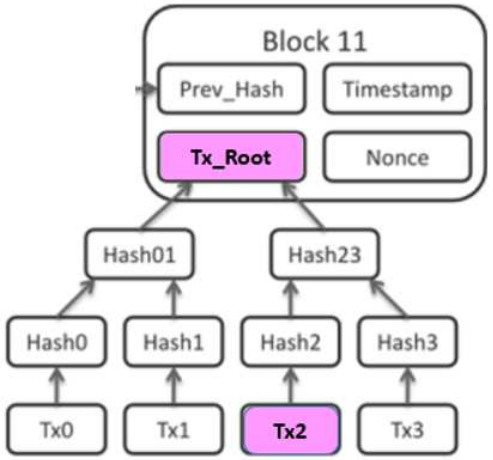
- Record of the transfer of Assets

- Record of a character string

TEXT IN BLOCK 0 OF THE BITCOIN BLOCKCHAIN



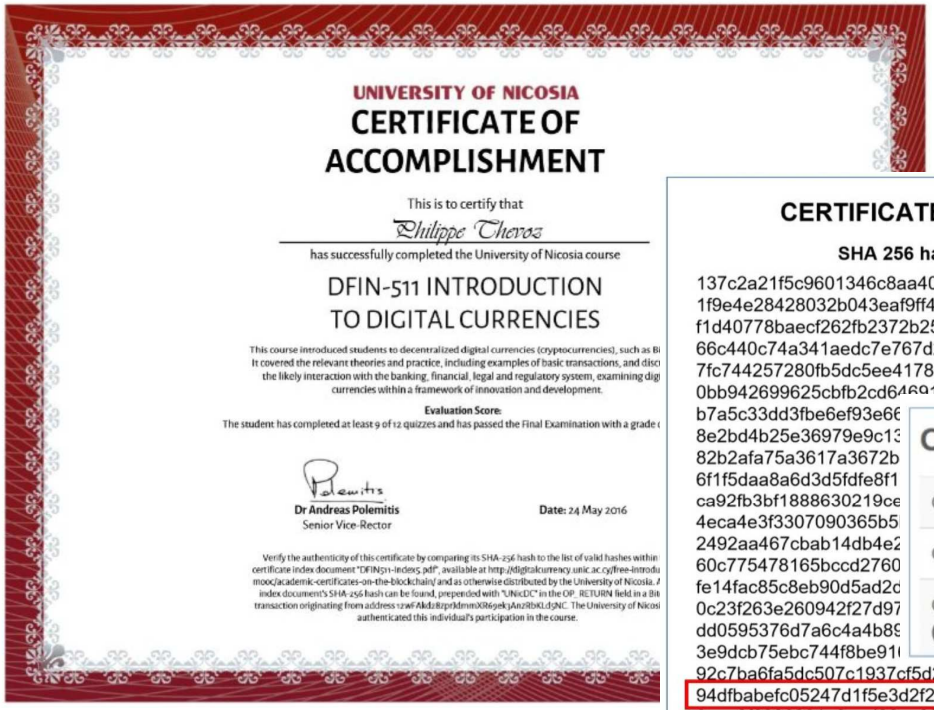
TRANSACTIONS



- Record of the transfer of Assets

- Record of a character string
  (e.g “Hash” in the Bitcoin Blockchain)

UNIVERSITY DEGREE CERTIFICATION



UNIVERSITY OF NICOSIA

CERTIFICATE OF ACCOMPLISHMENT

This is to certify that

Philippe Thevoz

has successfully completed the University of Nicosia course

DFIN-511 INTRODUCTION TO DIGITAL CURRENCIES

This course introduced students to decentralized digital currencies (cryptocurrencies), such as Bi
It covered the relevant theories and practice, including examples of basic transactions, and disc
the likely interaction with the banking, financial, legal and regulatory system, examining digi
currencies within a framework of innovation and development.

Evaluation Score:

The student has completed at least 9 of 12 quizzes and has passed the Final Examination with a grade

Dr Andreas Polemitis
Senior Vice-Rector

Date: 24 May 2016

Verify the authenticity of this certificate by comparing its SHA-256 hash to the list of valid hashes within
certificate index document "DFIN511-index5.pdf", available at http://digitalcurrency.unic.ac.cy/free-introdu
mooc/academic-certificates-on-the-blockchain/ and as otherwise distributed by the University of Nicosia.
index document's SHA-256 hash can be found, prepended with "UNicDC" in the OP_RETURN field in a Bit
transaction originating from address 12wFAkdz8zpYdmmXR69ekjAnz9bKLdjNC. The University of Nicos
authenticated this individual's participation in the course.

Hash of the Index

1ec3cc7497ee0fed85a095775a7e6bf2…….

CERTIFICATES OF ACCOMPLISHMENT

SHA 256 hashes of certificates awarded

137c2a21f5c9601346c8aa4015ee2b809feacd74eed36cf6c0cdd93b28a45cae
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Output Scripts

OP_DUP OP_HASH160 153a6a28f73ffdee6d7f61acada576a3481b990e OP_EQUALVERIFY OP_CHECKSIG

OP_DUP OP_HASH160 6e03dbf2109692fdcf21e8dbb0569ba376c1c955 OP_EQUALVERIFY OP_CHECKSIG

OP_RETURN 554e6963444320 1ec3cc7497ee0fed85a095775a7e6bf2ada83da6e5c0d127eb9abd9aaeaf00b4

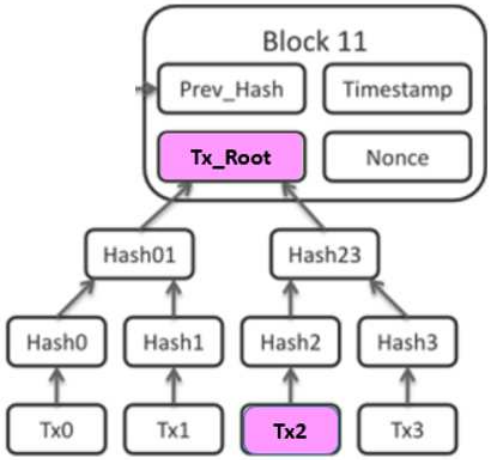
(decoded) UNicDC

Hash of the Certificate

94dfbabefc05247d1f5e3d2f2362be2f0…….

http://bit.ly/2b2WO46

TRANSACTIONS

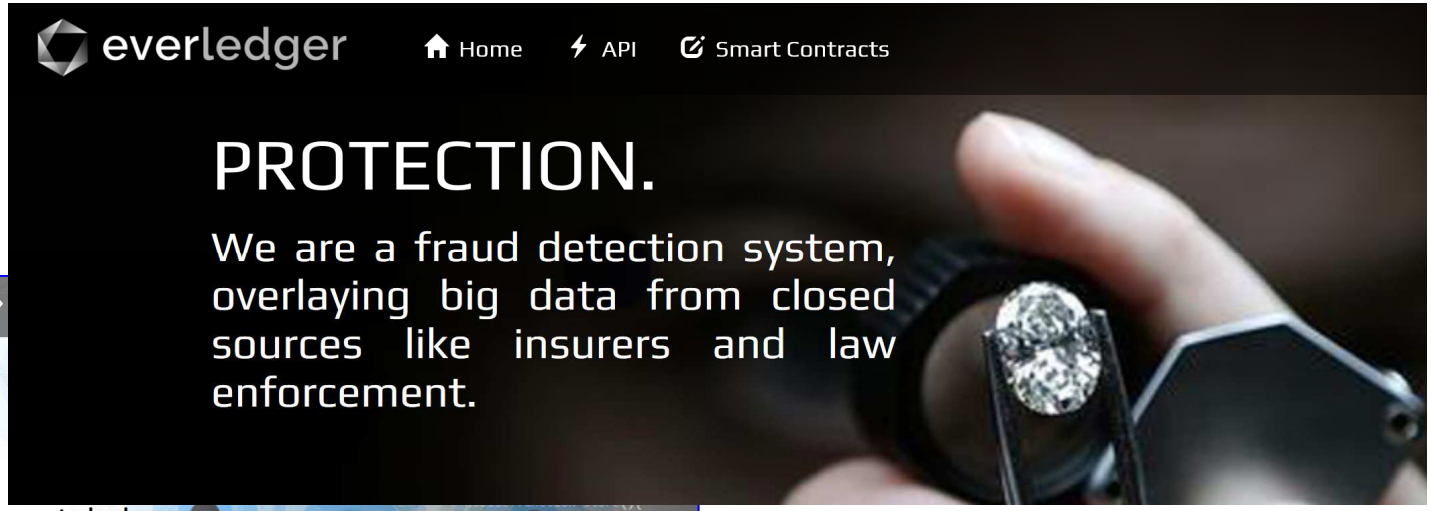


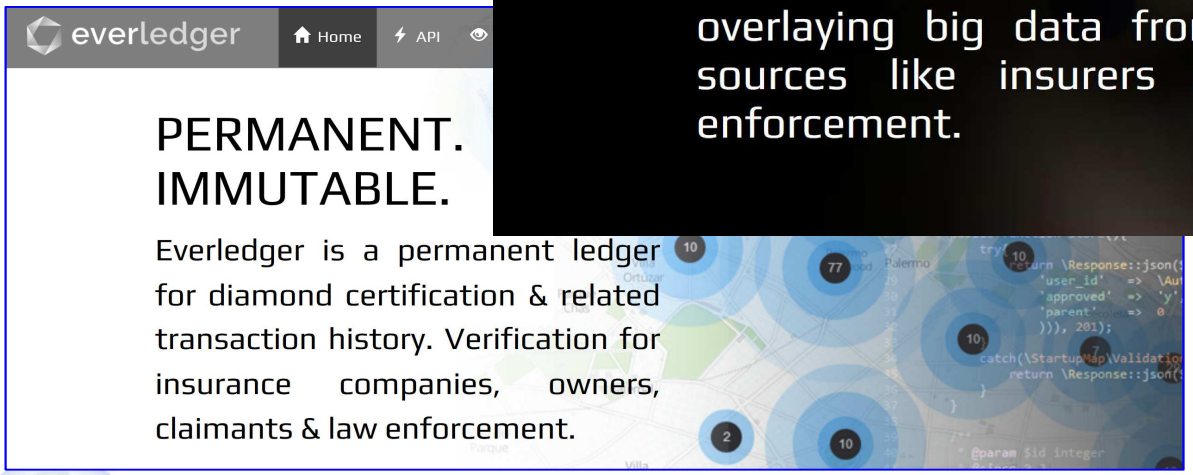
- Record of the transfer of Assets

- Record of a character string
  (e.g “Hash” in the Bitcoin Blockchain)

- Smart Contract (Ethereum)

EVERLEDGER – DIAMOND CERTIFICATION &TRACKING ON THE BLOCKCHAIN



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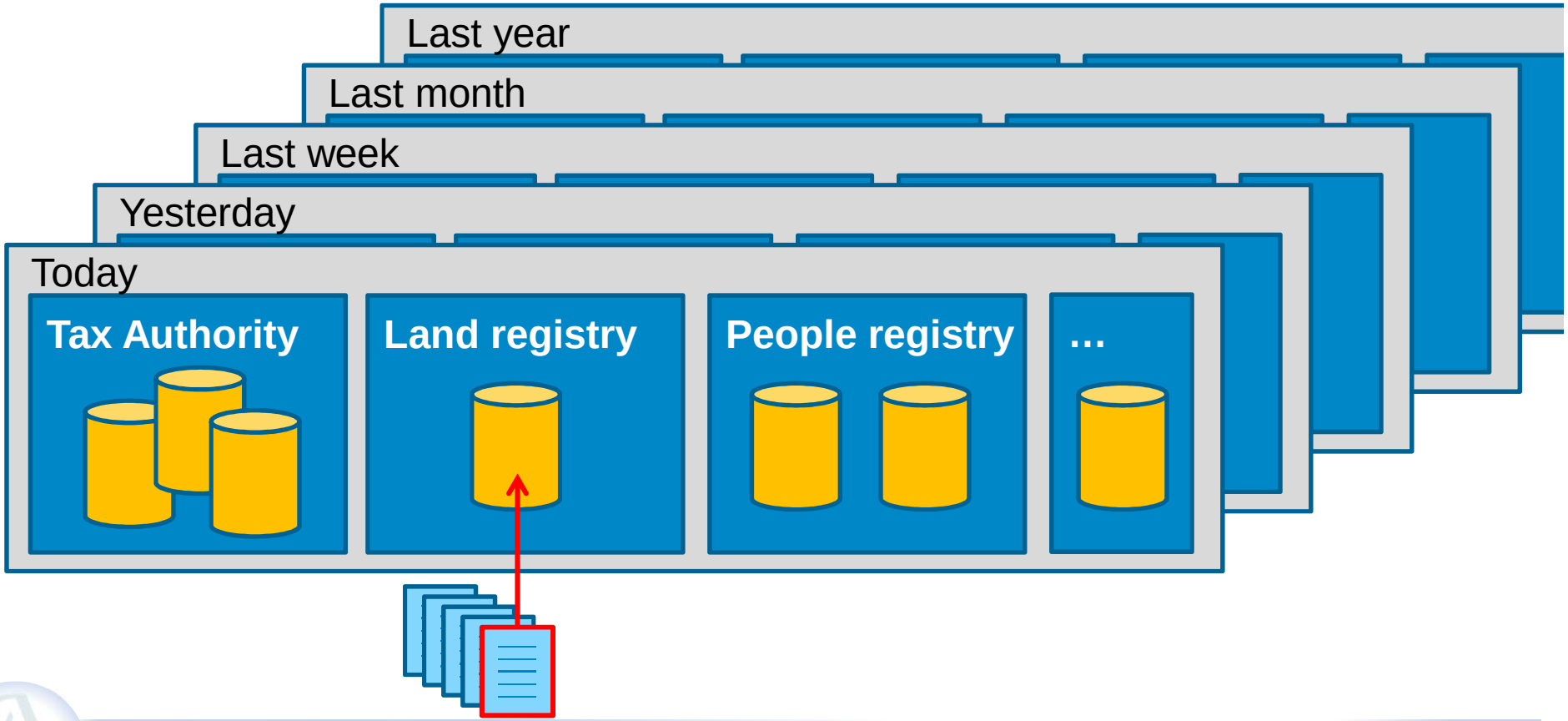
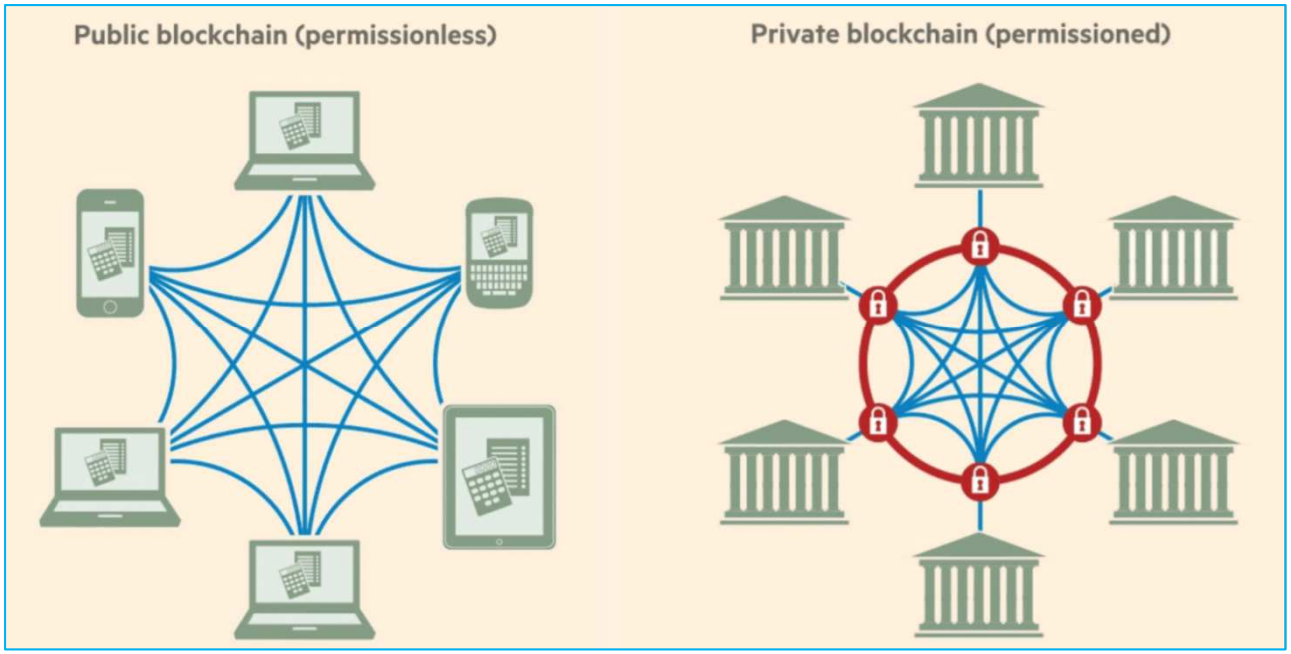
WHICH BLOCKCHAIN FOR GOVERNMENT SERVICES?

HOW TO SECURE MILLION OF DIGITAL DOCUMENTS ?



PUBLIC VS PRIVATE BLOCKCHAINS

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