

CLAIMS

What is claimed is:

1. A computer-implemented method for managing shared ownership in a block chain network, the method comprising:
 - 5 obtaining a parent cryptographic key associated with a blockchain object (1302);
 - obtaining a number (N) of parties to share control over the blockchain object (1304);
 - and
 - generating N child cryptographic keys based on the parent cryptographic key by applying a predetermined algorithm to the parent cryptographic key, wherein N is an integer
 - 10 greater than or equal to 2,
 - wherein applying the predetermined algorithm to the parent cryptographic key comprises:
 - generating N-1 random numbers having bit-lengths equal to a bit-length of the parent cryptographic key (1306) and performing a series of bitwise exclusive OR (XOR)
 - 15 operations between the parent cryptographic key and a first random number of the N-1 random numbers to generate a first output then sequentially performing XOR operations between an output of a previous XOR operation and a random number not previously used to generate an XOR child cryptographic key and obtain the N child cryptographic keys, wherein the N child cryptographic keys include the XOR child cryptographic key and the N-1 random numbers;
 - 20 receiving a plurality of cryptographic keys comprising the XOR child cryptographic key and the N-1 random numbers;
 - determining a number of the received plurality of cryptographic keys is equal to the number of parties sharing control over the blockchain object; and
 - in response to determining that the number of the received plurality of
 - 25 cryptographic keys is equal to the number of parties sharing control over the blockchain object, reconstructing the parent cryptographic key by performing a series of bitwise XOR operations, sequentially, on the received plurality of cryptographic keys and referencing third party auxiliary data.
- 30 2. The computer-implemented method according to claim 1, further comprising:
 - transmitting the N child cryptographic keys to corresponding parties (S4); and
 - deleting the parent cryptographic key (S6).

3. The computer-implemented method according to claim 1, wherein applying the predetermined algorithm to the parent cryptographic key comprises:
- modifying the parent cryptographic key based on a randomly generated character string.
- 5 4. A non-transitory, computer-readable medium storing one or more instructions executable by a computer system to perform operations comprising:
- obtaining a parent cryptographic key associated with a blockchain object (1302);
 - obtaining a number (N) of parties to share control over the blockchain object (1304);
 - and
- 10 generating N child cryptographic keys based on the parent cryptographic key by applying a predetermined algorithm to the parent cryptographic key, wherein N is an integer greater than or equal to 2, wherein applying the predetermined algorithm to the parent cryptographic key comprises:
- generating N-1 random numbers having bit-lengths equal to a bit-length of the
- 15 parent cryptographic key (1306) and performing a series of bitwise exclusive OR (XOR) operations between the parent cryptographic key and a first random number of the N-1 random numbers to generate a first output then sequentially performing XOR operations between an output of a previous XOR operation and a random number not previously used to generate an XOR child cryptographic key and obtain the N child cryptographic keys, wherein the N child
- 20 cryptographic keys include the XOR child cryptographic key and the N-1 random numbers;
- receiving a plurality of cryptographic keys comprising the XOR child cryptographic key and the N-1 random numbers;
 - determining a number of the received plurality of cryptographic keys is equal to the number of parties sharing control over the blockchain object; and
- 25 in response to determining that the number of the received plurality of cryptographic keys is equal to the number of parties sharing control over the blockchain object, reconstructing the parent cryptographic key by performing a series of bitwise XOR operations, sequentially, on the received plurality of cryptographic keys and referencing third party auxiliary data.

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5. The non-transitory, computer-readable medium according to claim 4, wherein the operations further comprise:
- transmitting the N child cryptographic keys to corresponding parties (S4); and
 - deleting the parent cryptographic key (S6).
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6. The non-transitory, computer-readable medium according to claim 5, wherein applying the predetermined algorithm to the parent cryptographic key comprises:
- modifying the parent cryptographic key based on a randomly generated character string.
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7. A computer-implemented system, comprising:
- obtaining a parent cryptographic key associated with a blockchain object (1302);
 - obtaining a number (N) of parties to share control over the blockchain object (1304);
 - and
 - generating N child cryptographic keys based on the parent cryptographic key by
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- applying a predetermined algorithm to the parent cryptographic key, wherein N is an integer greater than or equal to 2, wherein applying the predetermined algorithm to the parent cryptographic key comprises:
- generating N-1 random numbers having bit-lengths equal to a bit-length of the parent cryptographic key (1306) and performing a series of bitwise exclusive OR (XOR)
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- operations between the parent cryptographic key and a first random number of the N-1 random numbers to generate a first output then sequentially performing XOR operations between an output of a previous XOR operation and a random number not previously used to generate an XOR child cryptographic key and obtain the N child cryptographic keys, wherein the N child cryptographic keys include the XOR child cryptographic key and the N-1 random numbers;
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- receiving a plurality of cryptographic keys comprising the XOR child cryptographic key and the N-1 random numbers;
 - determining a number of the received plurality of cryptographic keys is equal to the number of parties sharing control over the blockchain object; and
 - in response to determining that the number of the received plurality of
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- cryptographic keys is equal to the number of parties sharing control over the blockchain object, reconstructing the parent cryptographic key by performing a series of bitwise XOR operations, sequentially, on the received plurality of cryptographic keys and referencing third party

auxiliary data.

8. The computer-implemented system according to claim 7, wherein the operations further comprise:

5 transmitting the N child cryptographic keys to corresponding parties (S4); and
 deleting the parent cryptographic key (S6).

9. The computer-implemented system according to claim 7, wherein applying the predetermined algorithm to the parent cryptographic key comprises:

10 modifying the parent cryptographic key based on a randomly generated character string.