

WHAT IS CLAIMED IS:

1. A system for securely communicating and storing information in a building management system (BMS), the system comprising:

a plurality of HVAC devices communicably coupled via a network, wherein each of the plurality of HVAC devices are configured to store a copy of an HVAC data chain comprising a plurality of blocks linked sequentially, wherein the plurality of HVAC devices comprise a first HVAC device comprising a processing circuit configured to:

generate a first block comprising device data and send the block to at least a portion of the plurality of HVAC devices;

receive a second block from one of the plurality of HVAC devices, wherein the second block comprises different device data;

solve the second block by determining a nonce value that causes a hash of the different device data, the nonce value, and a previous hash of a newest block in the HVAC data chain to meet a difficulty requirement;

add the solved block to the HVAC data chain of the first HVAC device as the newest block; and

send the solved block to each of the plurality of HVAC devices to be added as the newest block in the HVAC data chain stored on each of the plurality of HVAC devices, wherein the solved block comprises the different device data and the determined nonce value.

2. The system of Claim 1, wherein the plurality of blocks comprise HVAC data associated with a plurality of zones of a building associated with the BMS;

wherein the HVAC data chain further comprises, based on the plurality of blocks, a record of HVAC data for the building.

3. The system of Claim 1, wherein the processing circuit of the first HVAC device and a processing circuit of a second HVAC device of the plurality of HVAC devices are configured to determine an operating contract for the first HVAC device and the second HVAC device;

wherein the processing circuit of the first HVAC device is configured to:

generate a block comprising the operating contract; and

send the block comprising the operating contract to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices.

4. The system of Claim 1, wherein the first block generated by the processing circuit of the first HVAC device further comprises a digital signature and a public key;

wherein the processing circuit of the first HVAC device is configured to generate a digital signature for the first block with a private key and the HVAC data;

wherein the second block further comprises a second public key and a second digital signature, wherein the processing circuit of the first HVAC device is configured to verify the authenticity of the second block with the different HVAC data, the second digital signature, and the second public key.

5. The system of Claim 1, wherein the processing circuit of the first HVAC device is configured to periodically update the difficulty requirement based on a target time, wherein the target time is the time for the plurality of HVAC devices to solve a predefined number of blocks;

wherein the target time is based on the plurality HVAC devices being building security devices, building lighting devices, and devices that affect an environmental change in a building.

6. The system of Claim 1, wherein the system further comprises a licensing server comprising a processing circuit configured to:

receive a purchase for a software license for software for the first HVAC device;

generate a block comprising a software license for the first HVAC device in response to receiving the purchase for the software license for the first HVAC device; and

send the block comprising the software license for the first HVAC device to the plurality of HVAC devices to be added to the HVAC data chain stored on the plurality of HVAC devices.

7. The system of Claim 6, wherein the processing circuit of the first HVAC device is configured to identify the software license based on the HVAC data chain.

8. The system of Claim 7, wherein the processing circuit of the first HVAC device is further configured to perform, in response to identifying the software license, at least one of:

identifying a second HVAC device licensed for the software based on the HVAC data chain and send a request message to the second HVAC device for the software; and
sending the request message for the software to the licensing server.

9. The system of Claim 8, wherein the second HVAC device comprises a processing circuit configured to:

receive the request message from the first HVAC device;

determine that the first HVAC device is licensed for the requested software based on the HVAC data chain indicating that the first HVAC device is licensed for the requested software; and

send the requested software to the first HVAC device in response to determining that the HVAC data chain indicates that the first HVAC device is licensed for the requested software.

10. The system of Claim 1, wherein the processing circuit of the first HVAC device is configured to:

generate an access request for HVAC data of a second HVAC device; and

send the access request for the HVAC data to the second HVAC device;

wherein the second HVAC device comprises a processing circuit configured to:

receive the access request from the first HVAC device;

generate a block authorizing the first HVAC device to request the HVAC data of the second HVAC device; and

send the authorization block to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices;

wherein the processing circuit of the first HVAC device is further configured to send a request for the HVAC data to the second HVAC device in response to determining that the first HVAC device is authorized to receive the building data.

11. The system of Claim 10, wherein the processing circuit of the first HVAC device is configured to:

identify one of the plurality of the HVAC devices that have access to the HVAC data based on the HVAC data chain;

send a request for the HVAC data to the identified HVAC device; and

receive the HVAC data from the identified HVAC device;

wherein the identified HVAC device comprises a processing circuit configured to:

receive the request for the HVAC data from the first HVAC device;
determine that the first HVAC device has access to the HVAC data based on the HVAC data chain; and

send the HVAC data to the first HVAC device in response to determining that the first HVAC device has access to the HVAC data of the second HVAC device.

12. A method for securely communicating and storing information among a plurality of HVAC devices in a building management system (BMS), the method comprising:

generating, by a first HVAC device, a first block comprising device data and send the block to at least a portion of the plurality of HVAC devices, wherein the first HVAC device is one of the plurality of HVAC devices;

receiving, by the first HVAC device, a second block from one of the plurality of HVAC devices, wherein the second block comprises different device data;

solving, by the first HVAC device, the second block by determining a nonce value that causes hashing the different device data, the nonce value, and a previous hash of a newest block in an HVAC data chain to meet a difficulty requirement, wherein each of the plurality of HVAC devices are configured to store the HVAC data chain that comprises a plurality of blocks linked sequentially;

adding, by the first HVAC device, the solved block to the HVAC data chain of the first HVAC device as the newest block; and

sending, by the first HVAC device, the solved block to each of the plurality of HVAC devices to be added to the HVAC data chain stored on each of the plurality of HVAC devices to be added as the newest block, wherein the solved block comprises the different device data and the determined nonce value.

13. The method of Claim 12, wherein the plurality of blocks comprise HVAC data associated with a plurality of zones of a building associated with the BMS;

wherein the HVAC data chain further comprises, based on the plurality of blocks, a record of HVAC data for the building;

wherein the plurality of blocks further comprise licensing information for the plurality of HVAC devices;

wherein the HVAC data chain further comprises, based on the plurality of blocks comprising licensing information, a record of licensing information for the plurality of HVAC devices.

14. The method of Claim 12, further comprising:
determining, by the first HVAC device and a second HVAC device, an operating contract for the first HVAC device and the second HVAC device; and
generating, by the first HVAC device, a block comprising the operating contract;
and
sending, by the first HVAC device, the block comprising the operating contract to the plurality of HVAC devices to be added to the HVAC data chain stored on the plurality of HVAC devices.
15. The method of Claim 12, wherein the first block further comprises a digital signature and a public key, wherein the method further comprises generating, by the first HVAC device, the digital signature for the first block with a private key and the HVAC data;
wherein the second block further comprises a second public key and a second digital signature, wherein the method further comprises verifying, by the first HVAC device, the authenticity of the second block with the different HVAC data, the second digital signature, and the second public key.
16. The method of Claim 12, further comprising periodically updating, by the first HVAC device, the difficulty requirement based on a target time, wherein the target time is the time for the plurality of HVAC devices to solve a predefined amount of blocks and is based on the plurality HVAC devices being building security devices, building lighting devices, and devices that affect an environmental change in a building.
17. The method of Claim 12, wherein the method further comprises:
receiving, by a license server, a purchase for a software license for software for the first HVAC device;
generating, by the license server, a block comprising a software license for the first HVAC device in response to receiving the purchase for the software license for the first HVAC device;
sending, by the license server, the block comprising the software license for the first HVAC device to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices;
identifying, by the first HVAC device, the software license based on the HVAC data chain; and

sending, by the first HVAC device, a request message for the software to the licensing server.

18. The method of Claim 12, the method further comprising:

generating, by the first HVAC device, an access request for HVAC data of a second HVAC device;

sending, by the first HVAC device, the access request for the HVAC data to the second HVAC device;

receiving, by the second HVAC device, the access request from the first HVAC device;

generating, by the second HVAC device, a block authorizing the first HVAC device to request the HVAC data of the second HVAC device;

sending, by the first HVAC device, the block to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices; and

sending, by the first HVAC device a request for the HVAC data to the second HVAC device.

19. The method of Claim 18, the method further comprising:

identifying, by the first HVAC device, one of the plurality of the HVAC devices that have access to the HVAC data based on the HVAC data chain;

sending, by the first HVAC device, a request for the HVAC data to the identified HVAC device;

receiving, by the identified HVAC device, the request for the HVAC data from the first HVAC device;

determining, by the identified HVAC device, that the first HVAC device has access to the HVAC data based on the HVAC data chain;

sending, by the identified HVAC device, the HVAC data to the first HVAC device in response to determining that the first HVAC device has access to the HVAC data of the second HVAC device; and

receiving, by the first HVAC device, the HVAC data from the one of the plurality of HVAC devices.

20. A system for securely communicating and storing information in a building management system (BMS), the system comprising:

a plurality of HVAC devices communicably coupled via a network, wherein each of the plurality of HVAC devices are configured to store a copy of an HVAC data chain comprising a plurality of data blocks linked sequentially, wherein the plurality of HVAC devices comprise a first HVAC device comprising a processing circuit configured to:

generate a first block comprising device data, a public key, and a digital signature, wherein the digital signature is generated based on the device data and a private key;

send the first block to the plurality of HVAC devices;

receive a second block from one of the plurality of HVAC devices, wherein the second block comprises different device data, a second public key, and a second digital signature;

verify the authenticity of the second block with the different HVAC data, the second signature, and the second public key;

solve the second block by determining a nonce value that causes hashing the different device data, the nonce value, and a previous hash of a newest block in the HVAC data chain to meet a difficulty requirement;

add the solved block to the HVAC data chain of the first HVAC device as the newest block; and

send the solved block to the plurality of HVAC devices to be added by each of the plurality of HVAC devices as the newest block in the HVAC data chain stored on each of the plurality of HVAC devices, wherein the solved block comprises the different device data and the determined nonce value.

21. The system of Claim 20, wherein the plurality of blocks comprise HVAC data associated with a plurality of zones of a building associated with the BMS;

wherein the HVAC data chain further comprises, based on the plurality of blocks, a record of HVAC data for the building;

wherein the plurality of blocks further comprise licensing information for the plurality of HVAC devices;

wherein the HVAC data chain further comprises, based on the plurality of blocks comprising licensing information, a record of licensing information for the plurality of HVAC devices.

22. The system of Claim 20, wherein the processing circuit of the first HVAC device is configured to periodically update the difficulty requirement based on a target time, wherein the target time is the time for the plurality of HVAC devices to solve a predefined amount of blocks;

wherein the target time is based on the plurality HVAC devices being building security devices, building lighting devices, and devices that affect an environmental change in a building.

23. The system of Claim 20, wherein the processing circuit of the first HVAC device and a processing circuit of a second HVAC device of the plurality of HVAC devices are configured to determine an operating contract for the first HVAC device and the second HVAC device; and

wherein the processing circuit of the first HVAC device is configured to generate a block comprising the operating contract; and

send the block comprising the operating contract to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices.

24. The system of Claim 20, wherein the system further comprises a licensing server comprising a processing circuit configured to:

receive a purchase for a software license for software for the first HVAC device;

generate a block comprising the software license for the first HVAC device in response to receiving the purchase for the software license for the first HVAC device; and

send the block comprising the software license for the first HVAC device to the plurality of HVAC devices to be solved and added to the HVAC data chain stored on the plurality of HVAC devices;

wherein the processing circuit of the first HVAC device is configured to identify the software license based on the HVAC data chain;

wherein the processing circuit of the first HVAC device is further configured to perform at least one of:

identify a second HVAC device licensed for the software based on the HVAC data chain and send a request message to the second HVAC device for the software; and

send the request message for the software to the licensing server;

wherein the processing circuit of the second HVAC device is configured to:

receive the request message from the HVAC device;
determine that the first HVAC device is licensed for the requested software based on the HVAC data chain indicating that the HVAC device is licensed for the requested software; and
send the requested software to the first HVAC device in response to determining that the HVAC data chain indicates that the first HVAC device is licensed for the requested software.

WHAT IS CLAIMED IS:

1. A system for securely communicating and storing information in a building system of a building, the system comprising:

a plurality of building devices communicably coupled via a network, wherein each of the plurality of building devices are configured to store a copy of a blockchain comprising a plurality of blocks linked sequentially, wherein the plurality of building devices comprise a first building device comprising a processing circuit, the processing circuit comprising one or more memory devices and one or more processors, the processing circuit configured to:

generate a first block comprising device data and send the first block to at least a portion of the plurality of building devices;

receive a second block from a second building device of the plurality of building devices;

solve the second block by determining a nonce value that causes a hash of data, the nonce value, and a previous hash of a newest block in the blockchain to meet a difficulty requirement;

add the solved block to the blockchain of the first building device as the newest block, wherein the blockchain of the first building device comprises one or more licensing blocks indicating license information for software of a respective one or more of the plurality of building devices; and

send the solved block to at least one of the plurality of building devices to be added as the newest block in the blockchain stored on at least one of the plurality of building devices, wherein the solved block comprises the different device data and the determined nonce value.

2. The system of claim 1, wherein the plurality of blocks comprise device data associated with a plurality of zones of the building associated with the building system;

wherein the blockchain further comprises, based on the plurality of blocks, a record of device data for the building.

3. The system of claim 1, wherein the processing circuit of the first building device and a processing circuit of the second building device are configured to determine an operating contract for the first building device and the second building device; wherein the processing circuit of the first building device is configured to: generate a block comprising the operating contract; and send the block comprising the operating contract to the plurality of building devices to be solved and added to the blockchain.

4. The system of claim 1, wherein the first block generated by the processing circuit of the first building device further comprises a digital signature and a public key; wherein the processing circuit of the first building device is configured to generate the digital signature for the first block with a private key and the device data;

wherein the second block further comprises a second public key and a second digital signature, wherein the processing circuit of the first building device is configured to verify authenticity of the second block with the different device data, the second digital signature, and the second public key.

5. The system of claim 1, wherein the processing circuit of the first building device is configured to periodically update the difficulty requirement based on a target time, wherein the target time is an amount of time for the plurality of building devices to solve a predefined number of blocks; wherein the target time is based on the plurality of building devices being building security devices, building lighting devices, and devices that affect an environmental change in the building.

6. The system of claim 1, wherein the system further comprises a licensing server comprising a processing circuit configured to: receive a purchase for a software license for the software for the first building device;

generate a block comprising the software license for the first building device in response to receiving the purchase for the software license for the first building device; and

send the block comprising the software license for the first building device to the plurality of building devices to be added to the blockchain stored on the plurality of building devices.

7. The system of claim 6, wherein the processing circuit of the first building device is configured to identify the software license based on the blockchain.

8. The system of claim 7, wherein the processing circuit of the first building device is further configured to perform, in response to identifying the software license, at least one of:

identifying the second building device licensed for the software based on the blockchain and send a request message to the second building device for the software; and sending the request message for the software to the licensing server.

9. The system of claim 8, wherein the second building device comprises a processing circuit configured to:

receive the request message from the first building device;

determine that the first building device is licensed for the software based on the blockchain indicating that the first building device is licensed for the software; and

send the software to the first building device in response to determining that the blockchain indicates that the first building device is licensed for the software.

10. The system of claim 1, wherein the processing circuit of the first building device is configured to:

generate an access request for device data of the second building device; and
send the access request for the device data to the second building device;

wherein the second building device comprises a processing circuit
configured to:

receive the access request from the first building device;

generate a block authorizing the first building device to request the
device data of the second building device; and

send the block authorizing the first building device to request the
device data of the second building device to the plurality of building devices
to be solved and added to the blockchain stored on the plurality of building
devices;

wherein the processing circuit of the first building device is further
configured to send a request for the device data to the second building device in
response to determining that the first building device is authorized to receive the
device data.

11. The system of claim 10, wherein the processing circuit of the first building device is configured to:

identify one of the plurality of building devices that have access to the
device data based on the blockchain;

send a second request for the device data to the identified building device;
and receive the device data from the identified building device;

wherein the identified building device comprises a processing circuit
configured to:

receive the second request for the device data from the first building device;

determine that the first building device has access to the device data based
on the blockchain; and

send the device data to the first building device in response to determining that the first building device has access to the device data of the second building device.

12. A method for securely communicating and storing information among a plurality of building devices in a building system of a building, the method comprising:

generating, by a first building device, a first block comprising device data, wherein the first building device is one of the plurality of building devices;

sending, by the first building device, the first block to at least a portion of the plurality of building devices;

receiving, by the first building device, a second block from a second building device of the plurality of building devices;

solving, by the first building device, the second block by determining a nonce value that causes hashing data, the nonce value, and a previous hash of a newest block in a blockchain to meet a difficulty requirement, wherein each of the plurality of building devices are configured to store the blockchain that comprises a plurality of blocks linked sequentially;

adding, by the first building device, the solved block to the blockchain of the first building device as the newest block, wherein the blockchain of the first building device comprises one or more licensing blocks indicating license information for software of a respective one or more of the plurality of building devices;

sending, by the first building device, the solved block to each of the plurality of building devices to be added to the blockchain stored on at least one of the plurality of building devices to be added as the newest block, wherein the solved block comprises the different device data and the determined nonce value.

13. The method of claim 12, wherein the plurality of blocks comprise device data

associated with a plurality of zones of the building associated with the building system;

wherein the blockchain further comprises, based on the plurality of blocks, a record of device data for the building;

wherein the plurality of blocks further comprise licensing information for the plurality of building devices;

wherein the blockchain further comprises, based on the plurality of blocks comprising the licensing information, a record of licensing information for the plurality of building devices.

14. The method of claim 12, further comprising: determining, by the first building device and the second building device, an operating contract for the first building device and the second building device; generating, by the first building device, a block comprising the operating contract; and sending, by the first building device, the block comprising the operating contract to the plurality of building devices to be added to the blockchain stored on the plurality of building devices.

15. The method of claim 12, wherein the first block further comprises a digital signature and a public key, wherein the method further comprises generating, by the first building device, the digital signature for the first block with a private key and the device data;

wherein the second block further comprises a second public key and a second digital signature, wherein the method further comprises verifying, by the first building device, authenticity of the second block with the different device data, the second digital signature, and the second public key.

16. The method of claim 12, further comprising periodically updating, by the first building device, the difficulty requirement based on a target time, wherein the target time is an amount of time for the plurality of building devices to solve a predefined amount of blocks;

wherein the target time is based on the plurality of building devices being building security devices, building lighting devices, and devices that affect an environmental change in the building.

17. The method of claim 12, wherein the method further comprises:

receiving, by a license server, a purchase for a software license for the software for the first building device;

generating, by the license server, a block comprising the software license for the first building device in response to receiving the purchase for the software license for the first building device;

sending, by the license server, the block comprising the software license for the first building device to the plurality of building devices to be solved and added to the blockchain stored on the plurality of building devices;

identifying, by the first building device, the software license based on the blockchain; and sending, by the first building device, a request message for the software to the license server.

18. The method of claim 12, the method further comprising:

generating, by the first building device, an access request for device data of the second building device;

sending, by the first building device, the access request for the device data to the second building device;

receiving, by the second building device, the access request from the first building device;

generating, by the second building device, a block authorizing the first building device to request the device data of the second building device;

sending, by the first building device, the block to the plurality of building devices to be solved and added to the blockchain stored on the plurality of building devices; and

sending, by the first building device, a request for the device data to the second building device.

19. The method of claim 18, the method further comprising:

identifying, by the first building device, one of the plurality of building devices that have access to the device data based on the blockchain;

sending, by the first building device, a second request for the device data to the identified building device;

receiving, by the identified building device, the second request for the device data from the first building device;

determining, by the identified building device, that the first building device has access to the device data based on the blockchain;

sending, by the identified building device, the device data to the first building device in response to determining that the first building device has access to the device data of the second building device; and

receiving, by the first building device, the device data from the one of the plurality of building devices.

20. A system for securely communicating and storing information in a building system of a building, the system comprising:

a plurality of building devices communicably coupled via a network, wherein each of the plurality of building devices are configured to store a copy of a blockchain comprising a plurality of blocks linked sequentially, wherein the plurality of building devices comprise a first building device comprising a processing circuit, the processing circuit comprising one or more memory devices and one or more processors, the processing circuit configured to:

generate a first block comprising device data, a public key, and a digital signature, wherein the digital signature is generated based on the device data and a private key;

send the first block to at least a portion of the plurality of building devices;

receive a second block from a second building device, wherein the second block comprises different device data, a second public key, and a second digital signature;

verify authenticity of the second block with the different device data, the second digital signature, and the second public key;

solve the second block by determining a nonce value that causes hashing the different device data, the nonce value, and a previous hash of a newest block in the blockchain to meet a difficulty requirement;

add the solved block to the blockchain of the first building device as the newest block, wherein the blockchain of the first building device comprises one or more licensing blocks indicating license information for software of a respective one or more of the plurality of building devices; and

send the solved block to the plurality of building devices to be added by each of the plurality of building devices as the newest block in the blockchain stored on each of the plurality of building devices, wherein the solved block comprises the different device data and the determined nonce value.

21. The system of claim 20, wherein the plurality of blocks comprise device data associated with a plurality of zones of the building associated with the building system; wherein the blockchain further comprises, based on the plurality of blocks, a record of device data for the building;

wherein the plurality of blocks further comprise licensing information for the plurality of building devices;

wherein the blockchain further comprises, based on the plurality of blocks comprising the licensing information, a record of licensing information for the plurality of building devices.

22. The system of claim 20, wherein the processing circuit of the first building device is configured to periodically update the difficulty requirement based on a

target time, wherein the target time is an amount of time for the plurality of building devices to solve a predefined amount of blocks;

wherein the target time is based on the plurality of building devices being building security devices, building lighting devices, and devices that affect an environmental change in the building.

23. The system of claim 20, wherein the processing circuit of the first building device and a processing circuit of the second building device of the plurality of building devices are configured to determine an operating contract for the first building device and the second building device; and

wherein the processing circuit of the first building device is configured to generate a block comprising the operating contract; and

send the block comprising the operating contract to the plurality of building devices to be solved and added to the blockchain stored on the plurality of building devices.

24. The system of claim 20, wherein the system further comprises a licensing server comprising a processing circuit configured to:

receive a purchase for a software license for the software for the first building device; generate a block comprising the software license for the first building device in response to receiving the purchase for the software license for the first building device; and

send the block comprising the software license for the first building device to the plurality of building devices to be solved and added to the blockchain stored on the plurality of building devices;

wherein the processing circuit of the first building device is configured to identify the software license based on the blockchain;

wherein the processing circuit of the first building device is further configured to perform at least one of:

identify the second building device licensed for the software based on the blockchain and send a request message to the second building device for the software; and

send the request message for the software to the licensing server; wherein a processing circuit of the second building device is configured to: receive the request message from the first building device;

determine that the first building device is licensed for the software based on the blockchain indicating that the first building device is licensed for the software; and

send the software to the first building device in response to determining that the blockchain indicates that the first building device is licensed for the software.