SUMMARY

I will be making a database representing the basic components of ablockchain. Blockchain is distributed ledger technology that is gaining popularity. The complexity of a blockchain protocol makes it suitable for a database. The database will have 5 entities (blockchain, node, account, users, and consensus algorithm) and 4 relationships. For more information of about entity relationships, see the outline.

A blockchain is a main network and distributed ledger.

A node is an a computer actor in the blockchain network that can access and modify the blockchain network.

An account is an address held by the blockchain network that stores cryptocurrency.

A consensus algorithm is used by blockchains to acheive consensus among all the nodes.

My site will be set up with the home page being the hub to view any blockchain info or consensus algorithm info. When a blockchain page is loaded, it displays all of the related info regarding that specific blockchain

OUTLINE

Blockchain entity

-A blockchain stores 0 or more accounts. (1 to many)

      -Technically, a blockchain can exist without any accounts although this is not common.

-A blockchain at 0 or more consensus algorithms (many to many)

      -A Blockchain with only 1 node can technically exist without a consensus algorithm

      -A blockchain may utilize more than 1 consensus algorithm

-A blockchain is accessed and maintained by 1 or more nodes (1 to many)

    -A blockchain cannot exist without nodes

-Blockchain table attributes:

    -<u>Name</u>

        The name of the blockchain

    -Block size

        The size of each block added to the blockchain in kb

    -Block time

        the time it takes to add a block to the blockchain in seconds

    -Cryptocurrreny

        The digital currency used in transaction that are included in the blocks of a blockchain

Account Entity

-An account is stored on exactly 1 blockchain (1 to many)

    -an account in this context does not exist if is not stored on a blockchain

    -an account can only be stored on the blockchain it was created on

-Account table attributes:

    -<u>Blockchain address</u>

        The address of the account stored on the blockchain

    -Cyrptocurrency amount

        The amount of cryptocurrency held in the account

Consensus Algorithm Entity

-A consensus algorithm is used by 0 or more blockchains (many to many)

    -A consensus algorithm can exist without being used by a blockchain

-multiple blockchains may use the same consensus algorithm

-Consensus Algorithm table attributes:

  -Name

    The name of the consensus algorithm

  -Energy efficiency score

    The rank of how energy efficient the algorithm is from 1 to 10

  -Security score

    The rank of how secure the algorithm is from 1 to 10

People Entity

-A person operates 0 or more nodes (many to many)

  -A person can operate 0 or more nodes

-People table attributes:

  -Social Security Number

    The ssn of the person

  -Use reason

    The reason the person is using the blockchain

  -First name

  -Last name

CREATE AND INSERT QUIRIES

CREATE TABLE `cons_algo_tbl`

(

       `name` varchar(255) NOT NULL,

       `sec_score` int(11) NOT NULL,

       `ee_score` int(11) NOT NULL,

       PRIMARY KEY (`name`)

) ENGINE=INNODB;

CREATE TABLE `blockchain_tbl`

(

       `name` varchar(255) NOT NULL,

       `crypto` varchar(255),

       `b_time` int(11) NOT NULL,

       `b_size` int(11) NOT NULL,

       PRIMARY KEY (`name`)

) ENGINE=INNODB;

CREATE TABLE `ca_bc_tbl`

```sql
(

        `cabc_algoname` varchar(255),

        `cabc_bcname` varchar(255),

        PRIMARY KEY (`cabc_algoname`,`cabc_bcname`),

        CONSTRAINT `cabc_algo` FOREIGN KEY (`cabc_algoname`)        REFERENCES
`cons_algo_tbl`(`name`) ON DELETE CASCADE ON UPDATE CASCADE,

        CONSTRAINT `cabc_bc` FOREIGN KEY(`cabc_bcname`)   REFERENCES
`blockchain_tbl`(`name`) ON DELETE CASCADE ON UPDATE CASCADE

) ENGINE=INNODB;




CREATE TABLE `account_tbl`

(

        `bc_address` varchar(255) NOT NULL,

        `bc` varchar(255),

        `crypto_amount` int(11) NOT NULL,

        PRIMARY KEY (`bc_address`),

        CONSTRAINT `fk_account_bc` FOREIGN KEY (`bc`) REFERENCES
        `blockchain_tbl`(`name`)ON DELETE SET NULL ON UPDATE CASCADE

) ENGINE=INNODB;




CREATE TABLE `node_tbl`

(

        `net_address` varchar(255) NOT NULL,

        `blockchain` varchar(255),

        `os` varchar(255) NOT NULL,

        PRIMARY KEY (`net_address`),
```

```sql
        CONSTRAINT `fk_node_bc`FOREIGN KEY (`blockchain`) REFERENCES
        `blockchain_tbl`(`name`)ON DELETE SET NULL ON UPDATE        CASCADE

) ENGINE=INNODB;


CREATE TABLE `people_tbl`

(

        `ssn` int(11) NOT NULL ,

        `use_reason` varchar(255),

        `f_name` varchar(255),

        `l_name` varchar(255),

        PRIMARY KEY (`ssn`)

) ENGINE=INNODB;


CREATE TABLE `node_people_tbl`

(

        `node_address` varchar(255),

        `people_ssn` int(11),

        PRIMARY KEY (`node_address`,`people_ssn`),

        CONSTRAINT `fk_np_node` FOREIGN KEY (`node_address`)        REFERENCES
`node_tbl`(`net_address`) ON DELETE CASCADE,

        CONSTRAINT `fk_np_people` FOREIGN KEY(`people_ssn`)        REFERENCES
`people_tbl`(`ssn`) ON DELETE CASCADE

) ENGINE=INNODB;


INSERT INTO cons_algo_tbl VALUES

('Proof of Work', 10, 1),

('Proof of Stake', 5, 8),
```

('Proof of Activity', 4, 3),

('Proof of Burn', 3, 8),

('Proof of Capacity', 4, 5),

('Proof of Elapsed Time', 6, 3);

INSERT INTO blockchain_tbl VALUES

('Bitcoin','BTC', 600, 1000),

('Ethereum', 'ETH', 15, 2),

('NXT', 'NXT', 60, 32),

('Decred', 'DCR', 300, 1000),

('Slimcoin', 'SLM', 30, 5);

INSERT INTO account_tbl VALUES

('1HB5XMLmzFVj8ALj6mfBsbifRoD4miY36v', 'Bitcoin', 8),

('1BoatSLRHtKNngkdXEeobR76b53LETtpyT', 'Bitcoin', 3),

('0x3D2e397F94e415D7773E72e44D5B5338a99E77d9', 'Ethereum', 672524),

('0x51f9C432A4e59aC86282D6ADaB4c2EB8919160EB', 'Ethereum', 530000),

('8aHu6usniGh9HG64g3hqHp8MWb8Qal70', 'NXT', 687),

('Hfg7hJHBI730hSg127h9JJH8dm8h8JGb3e', 'NXT', 25),

('sh298dHD8Hhw38fK0Bse3D1bnU86sb0bs3bd1GB', 'Decred', 2500),

('2J8sbuH90aHWg6VBAEJB2H3js382N1hIH08wNbJ', 'Decred', 27),

('18bBUsib38sbyiYIBUB3WnsoNI32NIWdbY6', 'Slimcoin', 3400),

('sUB7Wu3Y29IBSYvs372VGKLmu817VBjw8s', 'Slimcoin', 35);

INSERT INTO node_tbl VALUES

('223.38.9.23', 'Bitcoin', 'Windows'),

('189.29.243.8', 'Bitcoin', 'Linux'),

('88.140.8.76', 'Ethereum', 'Darwin'),

('82.211.176', 'Ethereum', 'Windows'),

('201.121.45.30', 'NXT', 'Windows'),

('120.88.24.9', 'NXT', 'Windows'),

('68.240.12.98', 'Decred', 'Darwin'),

('38.34.192.3', 'Decred', 'Linux'),

('180.68.4.39', 'Bitcoin', 'Windows'),

('26.209.18.3', 'Slimcoin', 'Linux');

INSERT INTO people_tbl VALUES

(192738216,'commerce', 'John', 'Connor'),

(026381628,'research', 'Sarah','Connor'),

(729471093,'research', 'Richard', 'Dutch'),

(927196345,'betting' , 'Ellen', 'Ripley'),

(283934794,'business', 'Bob', 'Turner'),

(956281047,'investment', 'Jake', 'Riff'),

(576389283,'commerce', 'Gabe', 'Fernandez'),

(820475749,'commerce', 'Tom', 'Skerritt'),

(276458903,'business', 'Arnold', 'Schwarzenneger'),

(284076547,'betting', 'Diane', 'Moore'),

(482683992,'development', 'Kathy', 'Winslet'),

(827469292,'research', 'Betty', 'White'),

(698028476,'betting', 'Peter', 'Wilfred'),

(782645903,'development', 'Jane', 'Doe');

```sql
INSERT INTO ca_bc_tbl VALUES

('Proof of Work', 'Bitcoin'),

('Proof of Work', 'Ethereum'),

('Proof of Stake', 'NXT'),

('Proof of Stake', 'Ethereum'),

('Proof of Activity', 'Decred'),

('Proof of Burn', 'Slimcoin');


INSERT INTO node_people_tbl VALUES

('223.38.9.23', 192738216),

('223.38.9.23', 026381628),

('189.29.243.8', 576389283),

('88.140.8.76', 729471093),

('82.211.176', 927196345),

('201.121.45.30', 283934794),

('88.140.8.76', 283934794),

('68.240.12.98', 956281047),

('180.68.4.39', 827469292),

('68.240.12.98', 820475749),

('26.209.18.3', 276458903),

('82.211.176', 284076547),

('180.68.4.39', 482683992),

('88.140.8.76', 827469292),

('38.34.192.3', 698028476),

('189.29.243.8', 782645903);
```

DATA MANIPULATION QUERIES

```
#select the names of all the recorded blockchains for display
#on homepage
SELECT name FROM `blockchain_tbl`
```

```
#select all the general info about Bitcoin to display on
#bitcoin page
SELECT * FROM `blockchain_tbl` WHERE name = "Bitcoin"
```

```
#select the first name, last name, and use reason for each user
#of a bitcoin node
SELECT p.f_name, p.l_name, p.use_reason FROM `people_tbl` p
      INNER JOIN `node_people_tbl` np ON np.people_id = p.id
      INNER JOIN `node_tbl` n ON n.net_address = np.node_address
```

```
WHERE n.blockchain = "Bitcoin"



#select all Bitcoin node ip adresses
SELECT net_address FROM `node_tbl` WHERE blockchain = "Bitcoin"



#select all Ethereum node ip adresses
SELECT net_address FROM `node_tbl` WHERE blockchain = "Ethereum"



#select all NXT node ip adresses
SELECT net_address FROM `node_tbl` WHERE blockchain = "NXT"



#select all Decred node ip adresses
SELECT net_address FROM `node_tbl` WHERE blockchain = "Decred"



#select all Slimcoin node ip adresses
SELECT net_address FROM `node_tbl` WHERE blockchain = "Slimcoin"



#select all Bitcoin account information
SELECT bc_address, crypto_amount FROM `account_tbl` WHERE bc =
"Bitcoin"



#select all Ethereum account information
SELECT bc_address, crypto_amount FROM `account_tbl` WHERE bc =
"Ethereum"


#select all NXT account information
SELECT bc_address, crypto_amount FROM `account_tbl` WHERE bc =
"NXT"


#select all Slimcoin account information
SELECT bc_address, crypto_amount FROM `account_tbl` WHERE bc =
"Slimcoin"


#select all Decred account information
SELECT bc_address, crypto_amount FROM `account_tbl` WHERE bc =
"Decred"
```

```sql
#insert new node
INSERT INTO node_tbl (net_address, blockchain, os) VALUES
([addressInput],[blockchainInput],[osInput])



#insert new account
INSERT INTO account_tbl (bc_address, bc, crypto_amount) VALUES
([addressInput],[bcInput],[crypto_amountInput])



#insert new user
INSERT INTO people_tbl (ssn, use_reason, f_name, l_name) VALUES
([ssnInput],[use_reasonInput],[f_nameInput],[l_nameInput])



#select all information from consensus algorithm table
SELECT * FROM `cons_algo_tbl`



#show all consensus algorithm and blockchain relationships
SELECT c.name, b.name FROM `cons_algo_tbl` c INNER JOIN
`blockchain_tbl` b ON b.cons_algo = c.name



#update consensus algorithm
UPDATE cons_algo_tbl SET name = [nameInput] , sec_score =
[sec_scoreInput], ee_score = [ee_scoreInput] WHERE name
=[nameInput]


#update consensus/blockchain relation
UPDATE ca_bc_tbl SET cabc_algoname = [cabc_algonameInput],
cabc_bcname = [cabc_bcnameInput]  WHERE cabc_algoname =
[cabc_algoname]


#delete consensus algorithm
DELETE FROM ca_bc_tbl WHERE cabc_algoname= [cabc_algonameInput]



#add consensus algorithm
INSERT INTO cons_algo_tbl (name, sec_score, ee_score) VALUES
([nameInput], [sec_scoreInput], [ee_scoreInput])
```

```
#add consensus/blockchain relationship
INSERT INTO ca_bc_tbl (cabc_algoname, cabc_bcname) VALUES
([cabc_algonameINput], [cabc_bcnameInput])
```

ER Diagram:

- Blockchain (entity) — attributes: Block time, Cryptocurrency, Block size, Name
- Node (entity) — attributes: Net address, Operating system
- Blockchain —1— **Accessed and maintained by** —M— Node
- Blockchain —1— **Stores** —M— Account
- Blockchain —M— **Uses** —N— Consensus Algorithm
- Node —M— **Operated by** —N— People
- Account (entity) — attributes: Blockchain address, Cryptocurrency amount
- Consensus Algorithm (entity) — attributes: Name, Energy efficiency score, Security score
- People (entity) — attributes: Social Security Number, Use reason, First name, Last name

Relational Schema:

Account
Blockchain address
Blockchain
Cryptocurrency amount

Blockchain
Name
Cryptocurrency
Block time
Block size

Node
Net address
Blockchain
Operating system

Node People Relationship
Node address
People SSN

People
SSN
Use reason
First name
Last name

Consensus Algorithm
Name
Security score
Energy efficiency score

Consensus Blockchain Relationship
Consensus Algo Name
Blockchain Name