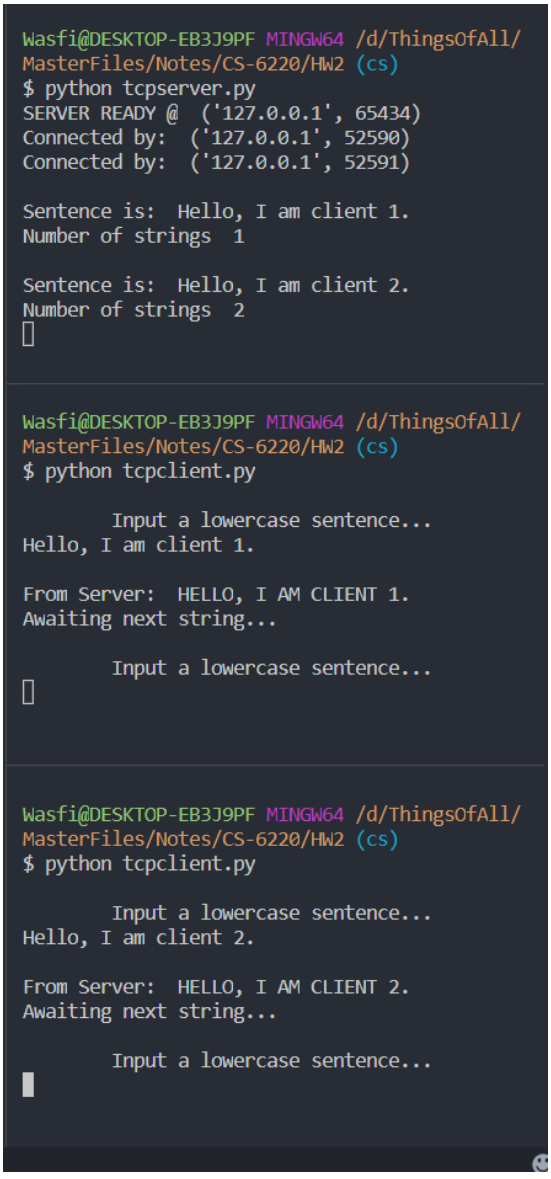
Wasfi Momen

9/22/18

1. TCP Server (Multithreaded)

Multithreaded Feature



Client shutdown feature

(Note the CLIENT HAS REQUESTED SHUTDOWN message. Server will continue to run if more than two clients are connected. Exception is reported but does not halt execution.)

1 client scenario

```
MasterFiles/Notes/CS-6220/HW2 (cs)
$ python tcpserver.py
SERVER READY @  ('127.0.0.1', 65434)
Connected by:  ('127.0.0.1', 52598)

CLIENT HAS REQUESTED SHUTDOWN
Traceback (most recent call last):
  File "tcpserver.py", line 168, in <module>
    TCPServer(host, port).start_client_listen
()
  File "tcpserver.py", line 140, in start_cli
ent_listen
    conn, addr = self.socket.accept()
  File "C:\Users\Wasfi\AppData\Local\Programs
\Python\Python36\lib\socket.py", line 205, in
 accept
    fd, addr = self._accept()
OSError: [WinError 10038] An operation was at
tempted on something that is not a socket

Wasfi@DESKTOP-EB3J9PF MINGW64 /d/ThingsOfAll/
MasterFiles/Notes/CS-6220/HW2 (cs)
$
```

```
Wasfi@DESKTOP-EB3J9PF MINGW64 /d/ThingsOfAll/
MasterFiles/Notes/CS-6220/HW2 (cs)
$ python tcpclient.py

        Input a lowercase sentence...

Interrupted
```

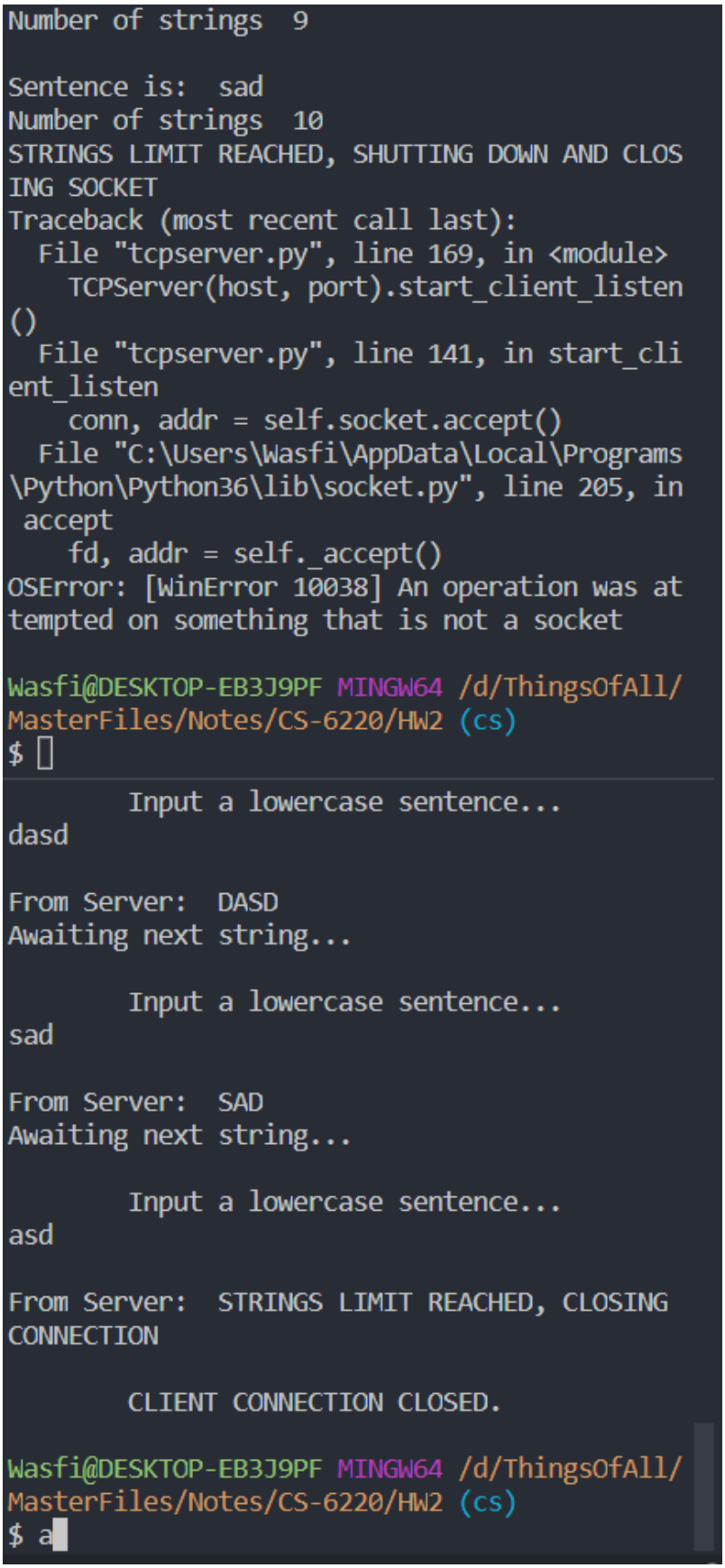
2 client scenario (server continues to function)

```
ent_listen
    conn, addr = self.socket.accept()
  File "C:\Users\Wasfi\AppData\Local\Programs
\Python\Python36\lib\socket.py", line 205, in
 accept
    fd, addr = self._accept()
OSError: [WinError 10038] An operation was at
tempted on something that is not a socket

Sentence is:  hello
Number of strings  1

Sentence is:  asdmlsad
Number of strings  2
```

```
Wasfi@DESKTOP-EB3J9PF MINGW64 /d/ThingsOfAll/
MasterFiles/Notes/CS-6220/HW2 (cs)
$ python tcpclient.py

        Input a lowercase sentence...

Interrupted

Wasfi@DESKTOP-EB3J9PF MINGW64 /d/ThingsOfAll/
MasterFiles/Notes/CS-6220/HW2 (cs)
$
```

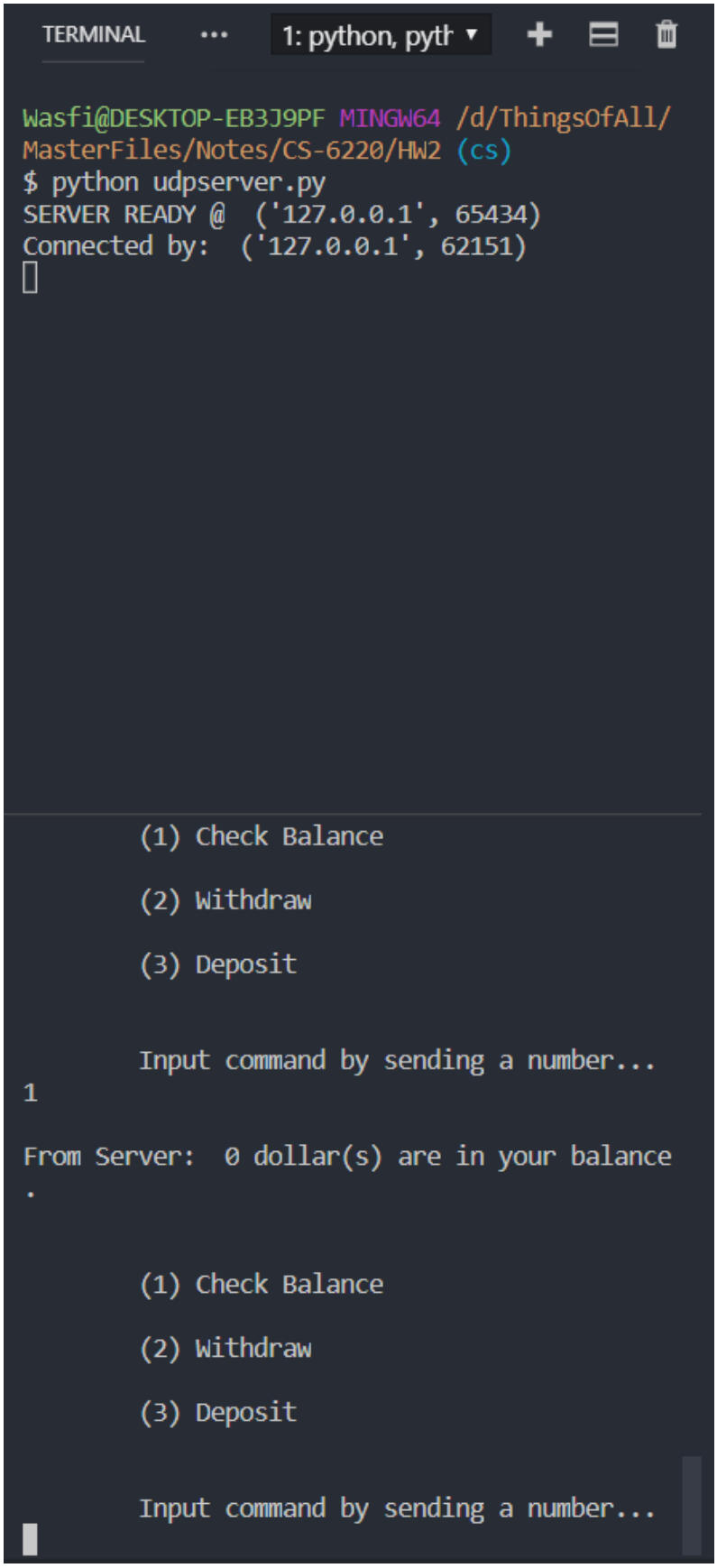
```
        Input a lowercase sentence...
hello

From Server:  HELLO
Awaiting next string...

        Input a lowercase sentence...
asdmlsad

From Server:  ASDMLSAD
Awaiting next string...

        Input a lowercase sentence...
```

Strings Limit Reached Feature

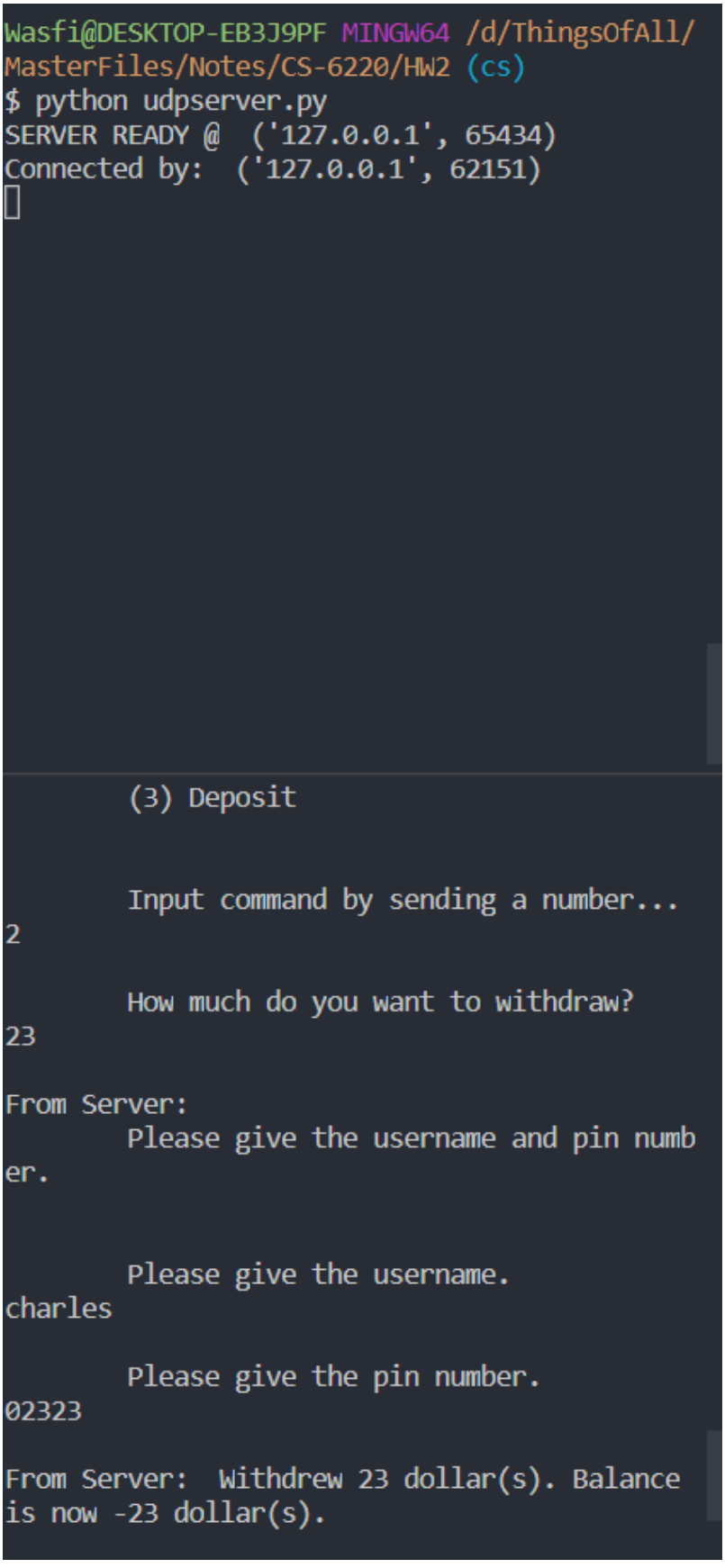


2. UDP Server

Check Balance Feature



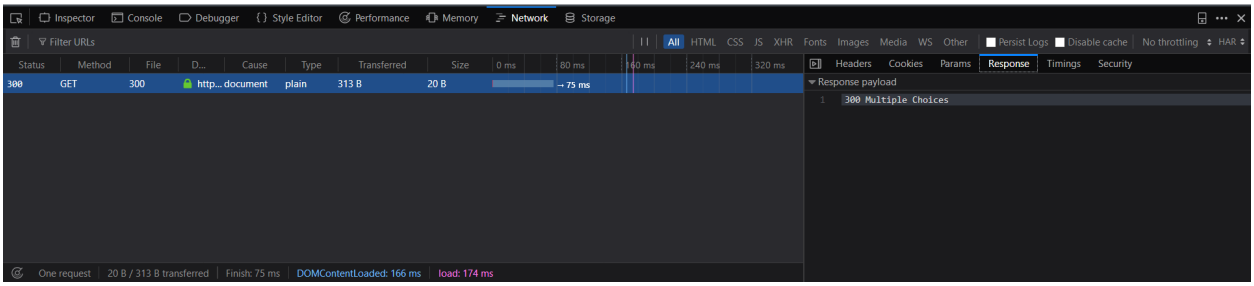
Withdraw Feature



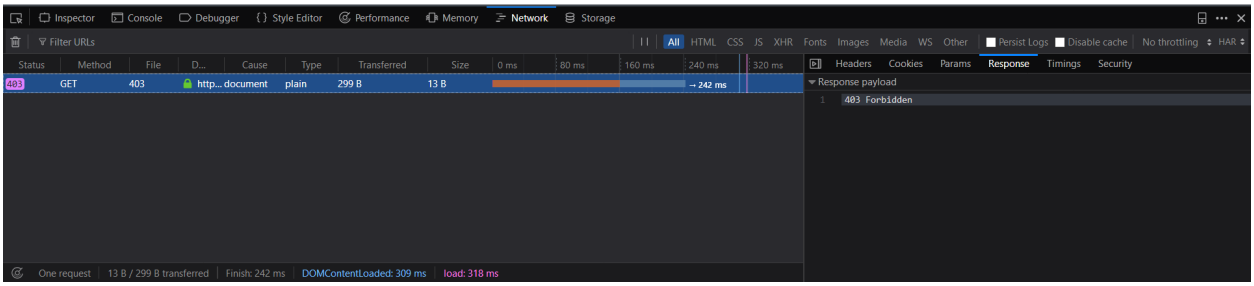
3. HTTP Responses

Went to httpstat.us and tried a couple of responses.

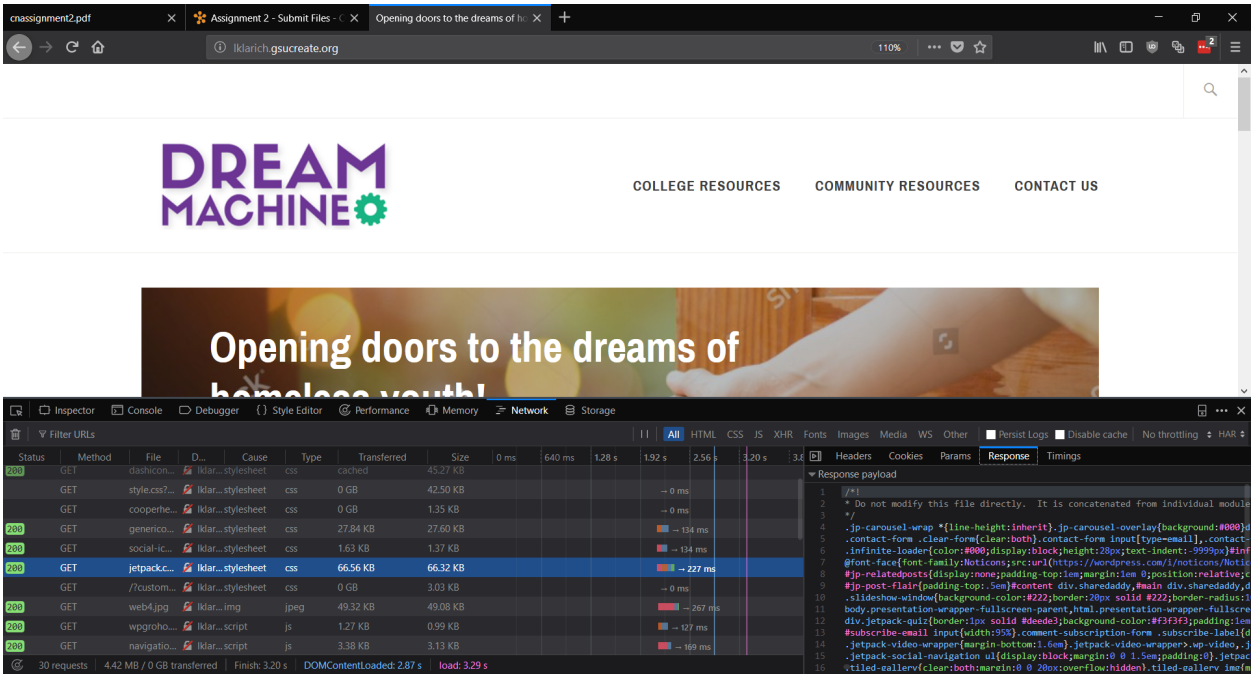
300 multiple choices



403 Forbidden



Also tried a GSU domain lklarich.gsucreate.org, but all it returned were 200s.



CODE

```
"""

udpserver.py

A udp server made in python.
Some variable and function names from socketserver.py in python 3.7 release.
Made by Wasfi Momen.

"""

"""
REQUIRMENTS
    - ~~Maintains file with: name, pin, and balance~~
    - ~~Prompts client for auth using name and pin~~
    - ~~Allows client to deposit and withdraw AFTER auth~~
    - ~~Messages client confirmation of record update~~
    - ~~Allows client to ask for and receive current balance~~
    ALL COMPLETE
"""

import socket
import sys


class UDPServer:

    address_family = socket.AF_INET  # only IPv4 connections
    socket_type = socket.SOCK_DGRAM  # constant to use UDP socket type

    # to be put into a file
    balance = 0
    username = "charles"
    pin = "02323"

    client_details = []  # list to hold client tuples

    # constructor from the socket.py module
    def __init__(self, server_address, server_port):
        self.server_address = server_address
        self.server_port = server_port
        self.socket = socket.socket(self.address_family, self.socket_type)
```

```
        try:
            self.write_to_file()  # initialize and write to file
            self.bind()
        except:
            self.socket.close()
            raise Exception('Error in setting up connection to host port.')

    def add_client_details(self, addr):
        """
        Add the tuples of our connected clients to a list.
        This is used namely to connect back to clients for an auth check.
        See auth_challenge() for more info.
        """
        if addr in self.client_details:
            return
        self.client_details.append(addr)
        print("Connected by: ", addr)

    def bind(self):
        """Binds the socket to any available port"""
        try:
            # a tuple of the address and port is used for the bind function
            self.socket.bind((self.server_address, self.server_port))
        except:
            self.socket.close()
            raise Exception(
                'Error in binding socket to address and port specified.')

    def check_auth(self, username, pin):
        # forgot list comprehension, so we separate the first chars here
        username = username[1:]
        pin = pin[1:]

        if (username == self.username and pin == self.pin):
            return True
        else:
            return False

    def auth_challege(self):
        """
        Challenges the client to provide credentials.
        Credentials are returned as a tuple that we can pass to
        check_auth individually.

        Returns true if credentials are correct and false otherwise.
```

```
        """

        message = "\n\tPlease give the username and pin number.\n"

        # send a message back to the client asking for auth info
        self.socket.sendto(message.encode(), (self.client_details[0]))

        # initate a new frame to get UDP data. (Probably can just do
self.socket.recvfrom(2048))
        conn, addr = self.socket.recvfrom(2048)
        credentials = conn.decode()
        credentials = credentials.split()
        credentials = [
            word for line in credentials for word in line.split()]  # separate
the username and password strings

        if (self.check_auth(credentials[0], credentials[1]) == True):
            return True
        else:
            return False

    def check_balance(self):
        return str(self.balance) + " dollar(s) are in your balance."

    def deposit(self, amount):
        amount = amount[0:]
        self.balance = self.balance + int(amount)
        self.write_to_file()

    def withdraw(self, amount):
        amount = amount[0:]
        self.balance = self.balance - int(amount)
        self.write_to_file()

    def process_command(self, message):
        """
        Takes in a message of 3 formats -- either b, w{int number}, or d{int
number}
        The first character in the message string represent the check_balance(),
deposit(),
        and withdraw() functions, respectively.

        For withdraw and deposit, the auth_challenge() validates the user
permission to
        execute the functions.
```

```
        Returns strings to send to clients, either a confirmation or invalid
message, to
        be then sent back to the client.

        """
        if (len(message) >= 1):
            if (message[0] == "b"):
                return self.check_balance()
            elif (message[0] == "w"):
                if (self.auth_challege() != False):
                    self.withdraw(message[1:])
                    return "Withdrew " + message[1:] + " dollar(s). Balance is
now " + str(self.balance) + " dollar(s)."
                else:
                    return "Invalid credentials. Please try the withdraw command
again."
            elif (message[0] == "d"):
                if (self.auth_challege() != False):
                    self.deposit(message[1:])
                    return "Deposited " + message[1:] + " dollar(s). Balance is
now " + str(self.balance) + " dollar(s)."
                else:
                    return "Invalid credentails. Please try the deposit command
again."
        else:
            return "Improper format, please send command again."

    def print_details(self):
        """Print out the server details"""
        print('SERVER READY @ ', self.socket.getsockname())

    def write_to_file(self):
        """
        Writes to the user.txt file. This function is called
        once every time a UDPServer is instantiated.

        """
        string = str(self.balance) + "\n" + \
            self.username + "\n" + self.pin + "\n"
        file = open("user.txt", "w")

        try:
            file.write(string)
            file.close()
```

```
        except Exception as e:
            file.close()  # just in case
            sys.exit(1)  # to force stop execution
            print(e)


host = "127.0.0.1"
# port = 0  # the OS should choose an open port for us
port = 65434


def main():
    try:
        server_sock = UDPServer(host, port)
        server_sock.socket.setblocking(1)
        server_sock.print_details()
        while True:
            conn, addr = server_sock.socket.recvfrom(2048)
            server_sock.add_client_details(addr)
            message = conn.decode()
            message = server_sock.process_command(message)
            server_sock.socket.sendto(message.encode(), addr)

        server_sock.socket.close()
    except KeyboardInterrupt:
        print("\nExited by Ctrl+C.")
        server_sock.socket.close()
        sys.exit(1)


main()
```

```
"""

udpclient.py

A udp client made in python.
Some variable and function names from socketserver.py in python 3.7 release.
Made by Wasfi Momen.

"""

import socket
import sys


class UDPClient:

    address_family = socket.AF_INET  # only IPv4 connections
    socket_type = socket.SOCK_DGRAM  # constant to use TCP socket type

    # constructor from the socket.py module
    def __init__(self, server_address, server_port):
        self.server_address = server_address
        self.server_port = server_port
        self.socket = socket.socket(self.address_family, self.socket_type)

    def connect(self):
        """Attempts to connect to the server socket, throws exception and closes
socket if fails."""
        try:
            self.socket.connect((self.server_address, self.server_port))
        except:
            self.socket.close()
            raise Exception('Failed to connect to server socket.')

    def process_command(self, number):
        """Formats a message to be received and interpreted server-side."""
        amount = 0

        if (number == "1"):
            return "b"
        elif (number == "2"):
            amount = input("\n\tHow much do you want to withdraw?\n")
            return ("w" + amount)
        elif (number == "3"):
            amount = input("\n\tHow much do you want to deposit?\n")
```

```
            return ("d" + amount)
        else:
            return "\nIllegal Command."


host = '127.0.0.1'
# port = 0  # the OS should choose an open port for us
port = 65434


def main():
    try:
        client_sock = UDPClient(host, port)
        client_sock.connect()
        while True:  # from python 3.7 docs examples
            print("\n")
            print("\t(1) Check Balance\n")
            print("\t(2) Withdraw\n")
            print("\t(3) Deposit\n")
            command = input("\n\tInput command by sending a number...\n")

            # get a message to send to the server
            message = client_sock.process_command(command)

            if (message != "\nIllegal Command."):
                # send message to server.
                client_sock.socket.sendto(
                    message.encode(), (host, port))

            conn, addr = client_sock.socket.recvfrom(2048)
            message_from_server = conn.decode()
            print("\nFrom Server: ", message_from_server)

            if (message_from_server == "\n\tPlease give the username and pin
number.\n"):
                username = input("\n\tPlease give the username.\n")
                pin = input("\n\tPlease give the pin number.\n")
                formatted = "u" + username + " " + "p" + pin
                client_sock.socket.sendto(formatted.encode(), (host, port))
                # we make another conn, addr here to get another frame of the UDP
packet.
                # dunno how to fix except keeping track of packet data sent and
received.
                conn, addr = client_sock.socket.recvfrom(2048)
                message_from_server = conn.decode()
```

```
                print("\nFrom Server: ", message_from_server)

        client_sock.socket.close()
    except KeyboardInterrupt:
        print("Interrupted")
        client_sock.socket.close()
        sys.exit(1)


main()
```

```
"""

tcpclient.py

A tcp client made in python.
Some variable and function names from socketserver.py in python 3.7 release.
Made by Wasfi Momen.

"""

import socket
import sys


class TCPClient:

    """TCPClient class that only binds the
    socket using the specified ports in the
    constructor.

    All other socket operations should
    be used by the .socket member access.

    """

    address_family = socket.AF_INET  # only IPv4 connections
    socket_type = socket.SOCK_STREAM  # constant to use TCP socket type

    # constructor from the socket.py module
    def __init__(self, server_address, server_port):
        self.server_address = server_address
        self.server_port = server_port
        self.socket = socket.socket(self.address_family, self.socket_type)

    def connect(self):
        """Attempts to connect to the server socket, throws exception and closes
socket if fails."""
        try:
            self.socket.connect((self.server_address, self.server_port))
        except:
            self.socket.close()
            raise Exception('Failed to connect to server socket.')


host = '127.0.0.1'
```

```
# port = 0  # the OS should choose an open port for us
port = 65434


def main():
    try:
        client_sock = TCPClient(host, port)
        client_sock.connect()
        while True:  # from python 3.7 docs examples
            sentence = input("\n\tInput a lowercase sentence...\n")
            client_sock.socket.sendall(sentence.encode())
            data = client_sock.socket.recv(1024)
            print("\nFrom Server: ", data.decode())
            # server has terminated connection, clean up and close socket
            if (data == "STRINGS LIMIT REACHED, CLOSING CONNECTION".encode()):
                print("\n\tCLIENT CONNECTION CLOSED.")
                client_sock.socket.shutdown(2)
                break
        client_sock.socket.close()
    except KeyboardInterrupt:
        print("Interrupted")
        client_sock.socket.sendall("CLIENT REQUESTS SHUTDOWN".encode())
        client_sock.socket.shutdown(2)
        client_sock.socket.close()
        sys.exit(1)


main()
```

```
"""

tcpserver.py

A tcp server made in python.
Some variable and function names from socketserver.py in python 3.7 release.
Made by Wasfi Momen.

"""

"""
REQUIRMENTS
    - ~~Capitalizes strings~~
    - ~~Max 10 strings~~
    - ~~Client ask for termination~~ **"Appropiate message" to terminate is
Ctrl+C**
    - ~~Limit reached, send message to client~~
    - ~~Multithreaded~~
    ALL COMPLETE

"""

"""
ISSUES
    - Non-graceful shutdown of more than two clients. Exception will be raised
    but server will continue to function till the last client disconnects.
    - KeyboardInterrupt not working correctly.
"""

import socket
import sys
import threading


class TCPServer:

    """
    TCPServer class contains the necessary functions
    for the application by keeping track of the strings
    and only binding the socket to the specified ports in
    the constructor.

    All other socket operations should
    be used by the .socket member access.
    """
```

```
    address_family = socket.AF_INET  # only IPv4 connections
    socket_type = socket.SOCK_STREAM  # constant to use TCP socket type

    # request_queue_size = 1  # we only take one connection

    num_strings = 0  # number of strings received
    client_details = []  # list of clients connected

    # constructor from the socket.py module
    def __init__(self, server_address, server_port):
        self.server_address = server_address
        self.server_port = server_port
        self.socket = socket.socket(self.address_family, self.socket_type)

        try:
            self.bind()
        except:
            self.socket.close()
            raise Exception('Error in setting up connection to host port.')

    def add_client_details(self, addr):
        """
        Add the tuples of our connected clients to a list.
        This is not currently used, but would be great to
        gracefully except during shutdowns of client sockets.
        """
        if addr in self.client_details:
            return
        self.client_details.append(addr)
        print("Connected by: ", addr)

    def capitalize_string(self, client_string):
        """Capitalizes string that is received from the client."""
        self.received_string()
        return client_string.upper()

    def bind(self):
        """Binds the socket to a port"""
        try:
            # option to reuse addresses for sockets
            self.socket.setsockopt(socket.SOL_SOCKET, socket.SO_REUSEADDR, 1)
            # a tuple of the address and port is used for the bind function
            self.socket.bind((self.server_address, self.server_port))
        except:
```

```
            self.socket.close()
            raise Exception(
                'Error in binding socket to address and port specified.')

    def process_clients(self, connection, address):
        """
        Main logic of the program. Takes care of the shutdow of
        client sockets and termination of server when strings limit
        is reached.
        """
        while True:
            sentence = connection.recv(1024).decode()

            # break out of while loop if shutdown request is given
            if (sentence == "CLIENT REQUESTS SHUTDOWN"):
                print("\nCLIENT HAS REQUESTED SHUTDOWN")
                # 2 means SHUT_RDWR or disable read and write, Windows only takes
numbers
                connection.shutdown(2)
                connection.close()
                break

            # break out of while loop if number of strings exceeds 10
            if (self.get_num_of_strings() >= 10):
                print(
                    "STRINGS LIMIT REACHED, SHUTTING DOWN AND CLOSING SOCKET")
                connection.sendall(
                    "STRINGS LIMIT REACHED, CLOSING CONNECTION".encode())
                connection.shutdown(2)
                connection.close()
                break

            print("\nSentence is: ", sentence)
            connection.sendall(
                self.capitalize_string(sentence).encode() + "\nAwaiting next
string...".encode())
            print("Number of strings ",
                  self.get_num_of_strings())
        self.socket.close()

    def start_client_listen(self):
        """
        Starts the mulithreaded listen for the
        clients. Also adds clients to a list of
        connected clients.
```

```
        Every client added will go through
        here to be processed by process_clients()
        """
        try:
            self.socket.listen(4)  # listen to 4 clients max
            self.print_details()
            while True:
                conn, addr = self.socket.accept()
                self.add_client_details(addr)
                threading.Thread(target=self.process_clients,
                                 args=(conn, addr)).start()

            self.socket.close()
        except KeyboardInterrupt:
            print("\nExited by Ctrl+C.")
            self.socket.close()
            sys.exit(1)

    def print_details(self):
        """Print out the server details"""
        print('SERVER READY @ ', self.socket.getsockname())

    def received_string(self):
        """Increments the number of string received by the server."""
        self.num_strings += 1

    def get_num_of_strings(self):
        """Returns the number of strings the server has received."""
        return self.num_strings


host = "127.0.0.1"
# port = 0  # the OS should choose an open port for us
port = 65434

TCPServer(host, port).start_client_listen()
```