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Name: Oliver Garrett (oga20)

Student ID: 13019796

Signature: [illegible]
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Date: 1/09/2021

COSC264 Assignment 1

In my codebase, there are 6 files:
server.py, **client.py**, **bithelper.py**, **request.py**, **response.py**, and **safesocket.py**.

bithelper, **request**, **response**, and **safesocket** must be accessible by both **server** and **client**.

client.py

```python
'''
client.py

Client python file

Author:
Oliver Garrett (oga20)

'''


from safesocket import safesocket
import socket
import request
import response
import os
import sys
import time


MAX_RECV = 4096

IP = socket.gethostbyname(socket.gethostname())


def init(ipv4, port):
    sock = safesocket(socket.AF_INET, socket.SOCK_STREAM)
    sock.settimeout(1)
    try:
        sock.connect((ipv4, port))
        return sock
    except BaseException as e:
        sock.close()
        print("Client: Socket connection failed")
        print("Error: " + str(e))
        exit(-4)


def request_file(sock, fname):
    if os.path.exists(fname):
        return False
    packet = request.make(fname)
    sock.sendall(packet)
    return True


def getdata(sock):
    try:
        rpacket = sock.recv(MAX_RECV)
    except socket.timeout:
        print("Client: Socket timed out; server is likely busy or down.")
        exit(-5)
    return rpacket

def start(sock):
    rpacket = getdata(sock)
    status, dlen, data = response.unmake(rpacket)
    if not status:
        print("Client: Server file not available or malformed packet.")
        exit(-5)

    return dlen, data


def write(sock, file):
    response = getdata(sock)
    file.write(response)
    return len(response)


def run(sock, fname):
    print("Client: started...")
    success = request_file(sock, fname)

    if not success:
        print("Client: File already exists, will not overwrite")
        exit(-7)

    print("Client: Success in requesting file")
    data_left, filedata = start(sock)
    data_left -= len(filedata)

    with open(fname, "ab+") as file:
        file.write(filedata)

        while data_left > 0:
            datalen = write(sock, file)
            data_left -= datalen



def isip(ip):
    return ip.replace(".", "").isdigit()


def main():
    ipv4 = sys.argv[1]
    if not isip(ipv4):
        try:
            ipv4 = socket.getaddrinfo(ipv4)
        except:
            print(f"Client: Malformed or non existant domain: {ipv4}")
            exit(-1)

    portn = sys.argv[2]
    if not (portn.isdigit() and (1024 <= int(portn) <= 64000)):
        print("Client: Port number not an intger between 1024 and 64000")
        exit(-2)

    filename = sys.argv[3]
    if  os.path.isfile(filename):
        print(f"Client: Aborted! Overwriting file: {filename}")
        exit(-3)

    sock = init(ipv4, int(portn))
    run(sock, filename)

if __name__ == "__main__":
    main()
```

server.py

```
'''
Server file

Author:
Oliver Garrett
(oga20)

'''

import sys

sys.path.append("D:\\PROGRAMMING\\UNIVERSITY\\COSC264\\proj")
#  Temporary for my computer

import socket
from safesocket import safesocket
import time
import request
import response
import os
import math


MAX_RECV = 4096
```

```python
TIMEOUT = socket.timeout

socket.setdefaulttimeout(30)

def exit(*a,**ka): input("Halted")

def get_ip():
    return socket.gethostbyname(socket.gethostname())


def init(port):
    global sock
    sock = safesocket(socket.AF_INET, socket.SOCK_STREAM)
    try:
        sock.bind((get_ip(), port))
        return sock
    except Exception as e:
        sock.close()
        print(f"Server: Error binding socket on port {port}: \n{e}")
        exit()



def sendbad(sock):
    packet = response.make(0, bytearray())
    sock.sendall(packet)


def gettime():
    return time.strftime('%X %x %Z')


def sendall(newsock, packet):
    iter = math.ceil(len(packet) / MAX_RECV)
    for i in range(iter):
        newsock.sendall(packet[i * MAX_RECV : (i + 1) * MAX_RECV])


def loop(sock):
    try:
        (newsock, addr) = sock.safeaccept()
        newsock.settimeout(1)
    except BaseException as e:
        print("Server: accept refused to work" + str(e))
        exit()

    t1 = gettime()
    print(f"Server: Accepted connection from {addr} at {t1}")

    try:
        success, fnamelen, fname = request.unmake(newsock.recv(MAX_RECV))
    except socket.timeout as e:
        print(f"Server: client stopped responding. Resetting\n")
        newsock.close()
        return

    if success != 1:
        print("Server: client packet is incorrect")
        return sendbad(sock)

    if fnamelen != len(fname):
        print("Server: filename does not agree with filename length")
        return sendbad(sock)

    if not os.path.exists(fname):
        print("Server: non existant file")
        return sendbad(sock)

    with open(fname, "rb") as f:
        t = time.time()
        byts = f.read()
        packet = response.make(1, byts)
        t1 = time.time()
        print("Server: time taken to read: " + str(t1-t))
        try:
            # previously: newsock.sendall(packet)
            sendall(newsock, packet)
            print(f"Server: File successfully sent to {addr} at {gettime()}\n")
        except socket.timeout as e:
            print(f"Server: client stopped responding\n")
            newsock.close()



def run(sock):
    try:
        sock.listen()
    except:
        print("Server: Listen failed.")
        sock.close()
        exit()

    print("Server: Listening on ")
    print("Server: waiting for clients:\n")

    while True:
        loop(sock)



def main():
    inp = sys.argv[1]

    if (not inp.isdigit()):
        print("Server: Wrong input format. Expected integer.")

    port = int(inp)
    if not (1024 <= port <= 64000):
        print("Server: input error: expected a port number between 1024 and 64000 inclusiv
e.")
        exit(-1)

    sock = init(port)
    print(f"Server: Running server on {get_ip()}, {port}")
    run(sock)


if __name__ == "__main__":
    main()
```

request.py

```
'''
request.py

File for handling FileRequest packets

Author:
Oliver Garrett
(oga20)

'''


from bithelper import *


MAGIC_NUMBER = 0x497E
TYPE = 1 # type 1 is FileRequest


def make(filename):
    arr = bytearray()
    push16(arr, MAGIC_NUMBER)
    arr.append(TYPE)
    filenameLen = len(filename)
    push16(arr, filenameLen)
    if filenameLen > 1024:
        print("filename length too big")
        exit(1)

    for char in filename:
        arr.append(ord(char))

    return arr
```

```python
def unmake(bytes_) -> tuple([int, int, str]):
    arr = bytearray(bytes_)
    magic = get16(arr, 0)
    type_ = int(arr[2])
    filenameLen = get16(arr, 3)

    status = 1
    if magic != MAGIC_NUMBER or type_ != TYPE:
        status = 0

    fname = ''
    for char in arr[5:]:
        fname += chr(char)

    return (status, filenameLen, fname)


# Testing
if __name__ == "__main__":
    print("FileRequest: Running tests:")
    for x in ["djkfkdfkdfjkalndwoiejd.png", "q", "UUUUUUUUUU......ffff.cls"]:
        assert unmake(make(x))[-1] == x, str((unmake(make(x)), x))
    print("FileRequest: Tests passed.")
```

response.py

```python
'''
response.py

File for handling FileResponse packets

Author:
Oliver Garrett
(oga20)

'''


from bithelper import *
import random

MAGIC_NUMBER = 0x497E

TYPE = 2 # type 2 is FileResponse


def make(status, data : bytes):
    # if status is 0, failed, if status is 1, success!
    arr = bytearray()
    datalen = len(data)
    push16(arr, MAGIC_NUMBER)
    arr.append(TYPE)
    arr.append(status)

    push32(arr, datalen)
    return arr + data



def unmake(bytes_) -> tuple([int, int, bytearray]):
    arr = bytearray(bytes_)
    magic = get16(arr, 0)

    type_ = int(arr[2])
    if type_ != TYPE or magic != MAGIC_NUMBER:
        status = 0
    else:
        status = int(arr[3])
    datalen = get32(arr, 4)

    return (status, datalen, arr[8:])




# Testing
if __name__ == "__main__":
    print("FileResponse: Running tests:")
    for x in range(100):
        status = random.randint(0,20)
        data = bytearray(''.join(chr(random.randint(0,50)) for _ in range(10))
                         ,encoding='utf-8')
        assert unmake(make(status, data)) == (status, len(data), data), \
                (unmake(make(status, data)), (status, len(data), data))

    print("FileResponse: Tests passed")
```

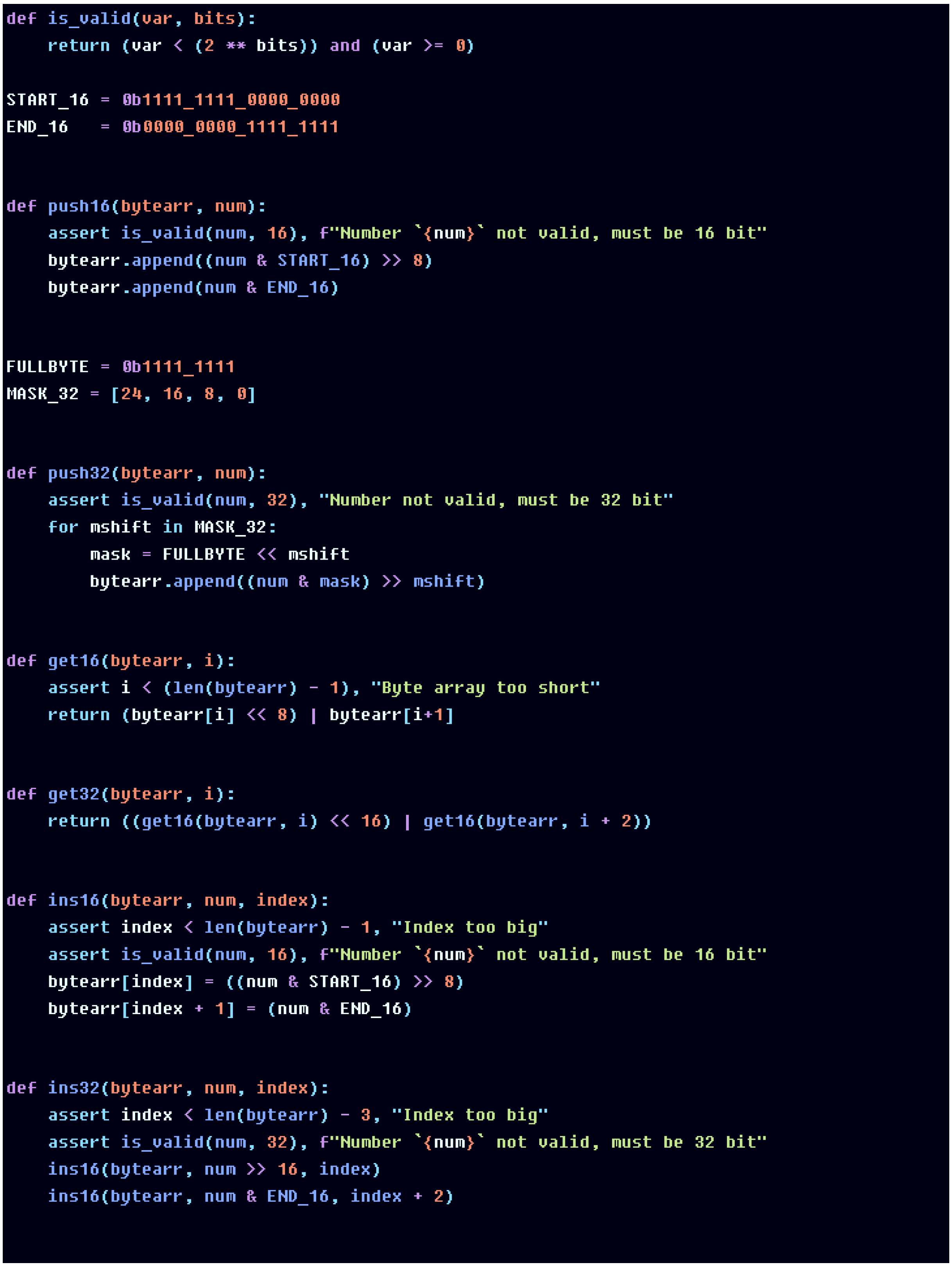
bithelper.py

```python
"""
bithelper.py

This module is used to aid in the process of creating, reading, and
modifying byte-like objects. (Primarily python bytearrays)

Author:
Oliver Garrett
oga20

"""
```



```python
def is_valid(var, bits):
    return (var < (2 ** bits)) and (var >= 0)

START_16 = 0b1111_1111_0000_0000
END_16   = 0b0000_0000_1111_1111


def push16(bytearr, num):
    assert is_valid(num, 16), f"Number `{num}` not valid, must be 16 bit"
    bytearr.append((num & START_16) >> 8)
    bytearr.append(num & END_16)


FULLBYTE = 0b1111_1111
MASK_32 = [24, 16, 8, 0]


def push32(bytearr, num):
    assert is_valid(num, 32), "Number not valid, must be 32 bit"
    for mshift in MASK_32:
        mask = FULLBYTE << mshift
        bytearr.append((num & mask) >> mshift)


def get16(bytearr, i):
    assert i < (len(bytearr) - 1), "Byte array too short"
    return (bytearr[i] << 8) | bytearr[i+1]


def get32(bytearr, i):
    return ((get16(bytearr, i) << 16) | get16(bytearr, i + 2))


def ins16(bytearr, num, index):
    assert index < len(bytearr) - 1, "Index too big"
    assert is_valid(num, 16), f"Number `{num}` not valid, must be 16 bit"
    bytearr[index] = ((num & START_16) >> 8)
    bytearr[index + 1] = (num & END_16)


def ins32(bytearr, num, index):
    assert index < len(bytearr) - 3, "Index too big"
    assert is_valid(num, 32), f"Number `{num}` not valid, must be 32 bit"
    ins16(bytearr, num >> 16, index)
    ins16(bytearr, num & END_16, index + 2)
```

safesocket.py

```python
'''
Safesocket file

Automatically closes sockets on python exit.

Author:
Oliver Garrett
(oga20)

'''


import socket
import atexit

class safesocket(socket.socket):
    '''
    safesocket class.
    Automatically closes sockets when python exits
    '''
    # A list of all sockets
    sbuffer = []

    def __init__(self, *a, **ka):
        super().__init__(*a, **ka)
        safesocket.sbuffer.append(self)
        self.setblocking(True)

    def safeaccept(self):
        '''
        Modifies accept
        '''
        (newsock, addr) = super().accept()
        safesocket.sbuffer.append(newsock)
        newsock.setblocking(True)
        return newsock, addr


def clearbuffer():
    for s in safesocket.sbuffer:
        s.close()

atexit.register(clearbuffer)
```