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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

'''

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

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'''

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

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 inclusive.")

        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

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

'''

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

"""

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

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"""

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

'''

Safesocket file

Automatically closes sockets on python exit.

Author:

Oliver Garrett

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'''

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)