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COMPUTER NETWORK

(Project 2)

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Contents

QUESTION 1

"Create an ICMP ping scanner and test the network to find the IP address of the given machine."

Used Technologies

1. Python Programming Language: This IP Address Scanning Tool was developed using the Python programming language.
2. Pyhcarm Community Edition 2022.3.3: IDE for Python
3. Threading Module: The threading module is used to perform parallel operations using multiple threads.
4. ping3 Library: The ping3 library is used to send ICMP ping requests and receive responses.

IP Address Scan Method:

- This IP Address Scan Tool uses ICMP ping requests to scan for IP addresses in a specific IP address range. It includes the following steps:
- The ping_range function takes the starting and ending IP addresses and returns a list of all IP addresses in that range.
- Starting and ending IP addresses are obtained from the user.
- The IP address range is determined using the ping_range function.
- The check_ip function checks if IP addresses are reachable by sending an ICMP ping request.
- Scanning is performed in parallel using multiple threads.
- Accessible IP addresses are added to the correctIPs list and saved in a file named "Correct_IP.txt".

Code Structure and Operation:

- The ping_range function takes the starting and ending IP addresses and creates a list of all the IP addresses between them.
- The check_ip function sends an ICMP ping request to the given IP address, and if it receives a response, it adds the correct IP addresses to the correctIPs list.
- Threads are used to scan IP addresses. A separate thread is created for each IP address and scanning is performed in parallel.
- Accessible IP addresses are written to a file named "Correct_IP.txt".
- "Scanning done." message is printed on the screen.

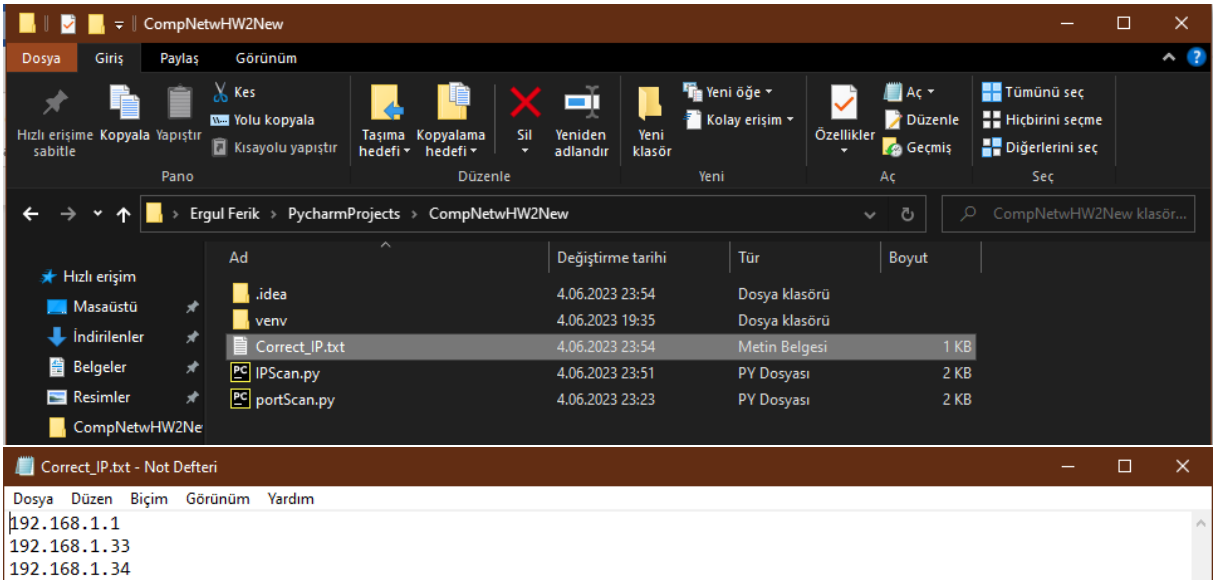
Source Code:

```python
import threading
from ping3 import ping


def ping_range(start_ip, end_ip):
    start = list(map(int, start_ip.split('.')))
    end = list(map(int, end_ip.split('.')))

    ip_range = []
    ip_range.append(start_ip)

    while start != end:
        start[3] += 1
        for i in range(3, 0, -1):
            if start[i] == 256:
                start[i] = 0
                start[i - 1] += 1
        ip_range.append('.'.join(map(str, start)))

    return ip_range


start_ip = input("Start IP:")
end_ip = input("End IP:")

ip_range = ping_range(start_ip, end_ip)
correctIPs = []


def check_ip(ip):
    try:
        if ping(ip):
            correctIPs.append(ip)
    except:
        pass


threads = []
for ip in ip_range:
    t = threading.Thread(target=check_ip, args=(ip,))
    threads.append(t)
    t.start()

for thread in threads:
    thread.join()

with open("Correct_IP.txt", "w") as f:
    for ip in correctIPs:
        f.write(ip + "\n")

print("Scanning done.")
```

Inputs and Output

```
with open("Correct_IP.txt", "w"... › for ip in correctIPs
Run:  IPScan
C:\Users\erg_m\PycharmProjects\CompNetwHW2New\venv\Scripts\python.exe C:\Users\erg_m\PycharmProjects\CompNetwHW2New\IPSc
Start IP:192.168.1.1
End IP:192.168.1.255
Scanning done.

Process finished with exit code 0
```

“Correct_IP.txt”



QUESTION 2

"Develop and/or design a tool / solution so that it performs port scan to find open ports on the target machine and discuss their advantages and disadvantages over other solutions."

Used Technologies

1. Python Programming Language: This Port Scanning Tool was developed using the Python programming language.
2. Pyhcarm Community Edition 2022.3.3: IDE for Python
3. socket Module: The socket module is used to perform port scanning using TCP/IP sockets.
4. Threading Module: The threading module is used to perform parallel operations using multiple threads.
5. queue Module: The queue module is used to share data between threads.

Port Scan Method:

- The destination IP address is passed as a parameter to the scan function.
- Using the socket module, the IP address is resolved and assigned to the t_IP variable.
- A certain timeout value (socket.setdefaulttimeout(0.25)) is set in the socket module for scanning.
- The portscan function tries to establish a TCP connection to the specified IP address and port combination.
- If the connection is successful, a message is printed stating that port is accessible, and this information is added to the ip_and_port list.
- Scanning is performed in parallel using multiple threads.
- Threads used in scanning are managed by the queue module.

Code Structure and Operation:

- A list named correctIPs is created and added to this list by reading the correct IP addresses from the "Correct_IP.txt" file.
- The scan function is run for each correct IP address and the accessible ports are added to the ip_and_port list.
- Accessible ports are associated with the correct IP addresses.
- Finally, the scan results are printed to the screen.

Source Code:

```python
import socket
import threading

from queue import Queue

ip_and_port = []


def scan(targetIP):
    global ip_and_port

    t_IP = socket.gethostbyname(targetIP)
    socket.setdefaulttimeout(0.25)
    print_lock = threading.Lock()

    def portscan(port):

        global ip_and_port

        s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
        try:
            con = s.connect((t_IP, port))
            with print_lock:
                ip_and_port.append(str(t_IP) + ":" + str(port))
            con.close()
        except:
            pass

    def threader():
        while True:
            workers = q.get()
            portscan(workers)
            q.task_done()

    q = Queue()

    for x in range(100):
        t = threading.Thread(target=threader)
        t.daemon = True
        t.start()

    for worker in range(1, 500):
        q.put(worker)

    q.join()


correctIPs = []

with open("Correct_IP.txt") as f:
    for i in f.readlines():
        correctIPs.append([i.strip()])

for i in correctIPs:
    scan(i[0])

for ip in correctIPs:
    for i in ip_and_port:
        arr = str(i).split(":")
        if ip[0] == arr[0]:
            ip.append(arr[1])

for i in correctIPs:
    if len(i) > 1:
        print(i[0], " is reachable and ports are : ")
        for j in range(1, len(i)):
            print(i[j])
    else:
        print(i[0], " is reachable but have not port")
```

Output

```
scan()
Run:  portScan
C:\Users\erg_m\PycharmProjects\CompNetwHW2New\venv\Scripts\python.exe C:\Users\erg_m\PycharmProjects\CompNetwHW2New\port
192.168.1.1  is reachable and ports are :
53
80
443
192.168.1.33  is reachable and ports are :
139
135
445
192.168.1.34  is reachable but have not port
192.168.1.37  is reachable but have not port

Process finished with exit code 0
```

Advantages and Disadvantages:

Advantages:

- Port scanning using parallel processes significantly reduces scanning time.
- Since scanning is performed with multiple threads, multiple ports can be checked at the same time and faster results can be obtained.
- Python programming language is easy to use and flexible. Therefore, the development and customization processes are easier.

Disadvantages:

- Sufficient resources and timing capabilities are needed to scan all ports in a given IP range. This may cause some restrictions when browsing large IP address ranges.
- Some target systems can detect and take action against network scanning activities such as port scanning. This may hinder the scanning process or affect the results.