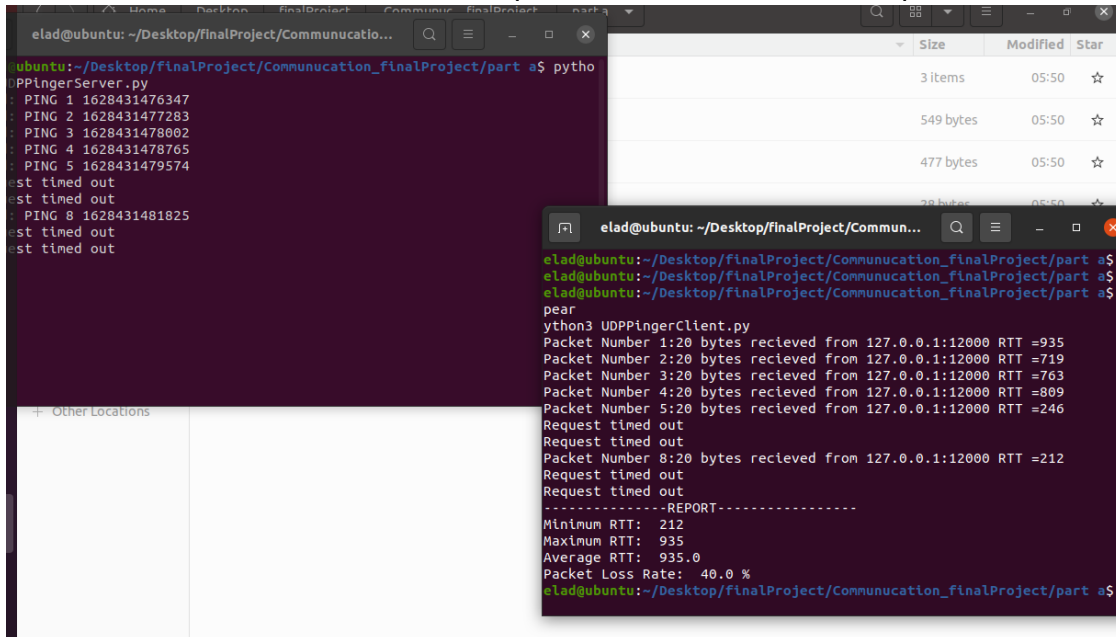


פרויקט סוף קורס – אלעד ווקנין והילה שושן

חלק ראשון :

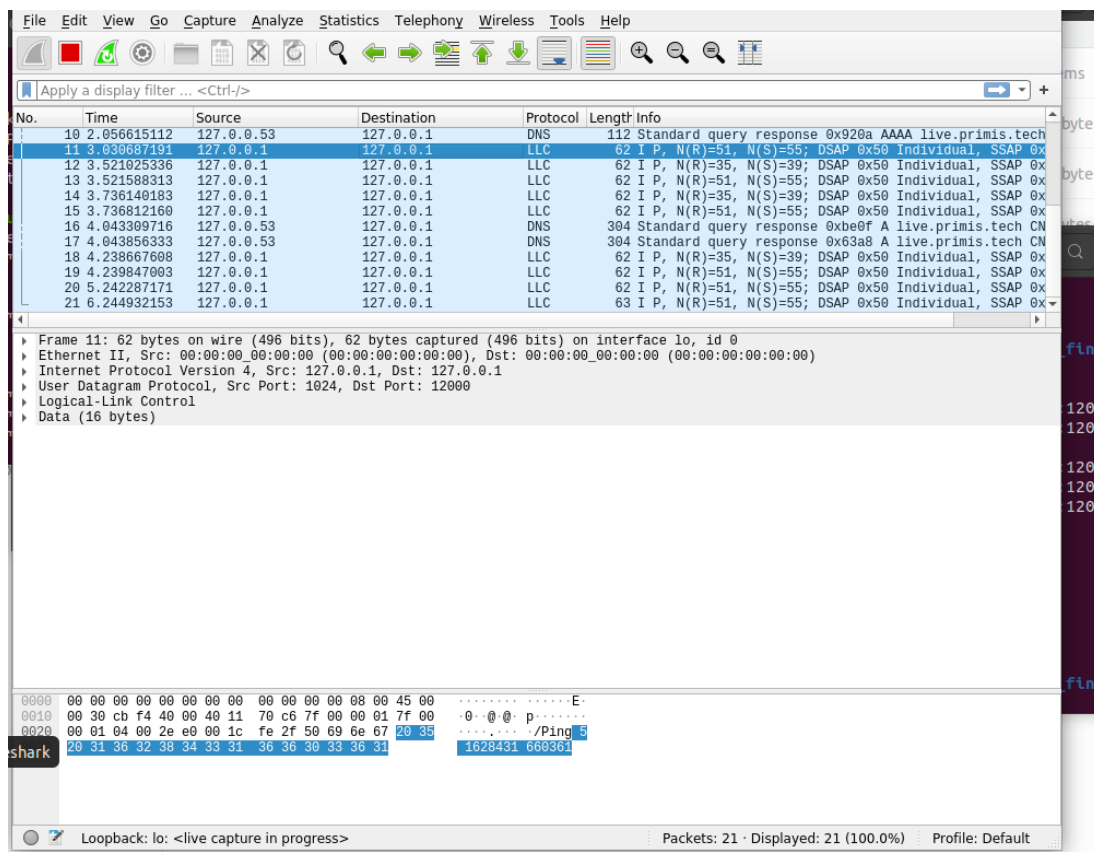
שליחת 10 פינגים, קבלתם, חישוב הRTT וחישוב הפאקטות שנאבדו.



```
elad@ubuntu: ~/Desktop/finalProject/Communication_finalProject/part a$ python UDPPingerClient.py
PING 1 1628431476347
PING 2 1628431477283
PING 3 1628431478002
PING 4 1628431478765
PING 5 1628431479574
Request timed out
Request timed out
PING 8 1628431481825
Request timed out
Request timed out

elad@ubuntu: ~/Desktop/finalProject/Communication_finalProject/part a$
elad@ubuntu: ~/Desktop/finalProject/Communication_finalProject/part a$
elad@ubuntu: ~/Desktop/finalProject/Communication_finalProject/part a$
python3 UDPPingerClient.py
Packet Number 1:20 bytes received from 127.0.0.1:12000 RTT =935
Packet Number 2:20 bytes received from 127.0.0.1:12000 RTT =719
Packet Number 3:20 bytes received from 127.0.0.1:12000 RTT =763
Packet Number 4:20 bytes received from 127.0.0.1:12000 RTT =809
Packet Number 5:20 bytes received from 127.0.0.1:12000 RTT =246
Request timed out
Request timed out
Packet Number 8:20 bytes received from 127.0.0.1:12000 RTT =212
Request timed out
Request timed out
-----REPORT-----
Minimum RTT: 212
Maximum RTT: 935
Average RTT: 935.0
Packet Loss Rate: 40.0 %
elad@ubuntu: ~/Desktop/finalProject/Communication_finalProject/part a$
```

הצגה של הנתונים ב wireshark (שליחה וקבלה מול פורטים 12000,1024 וlocalhost – 127.0.0.1)



חלק שני :

האזנה לפורט 5060 עם IPv4 עם פקודת netstat -an:

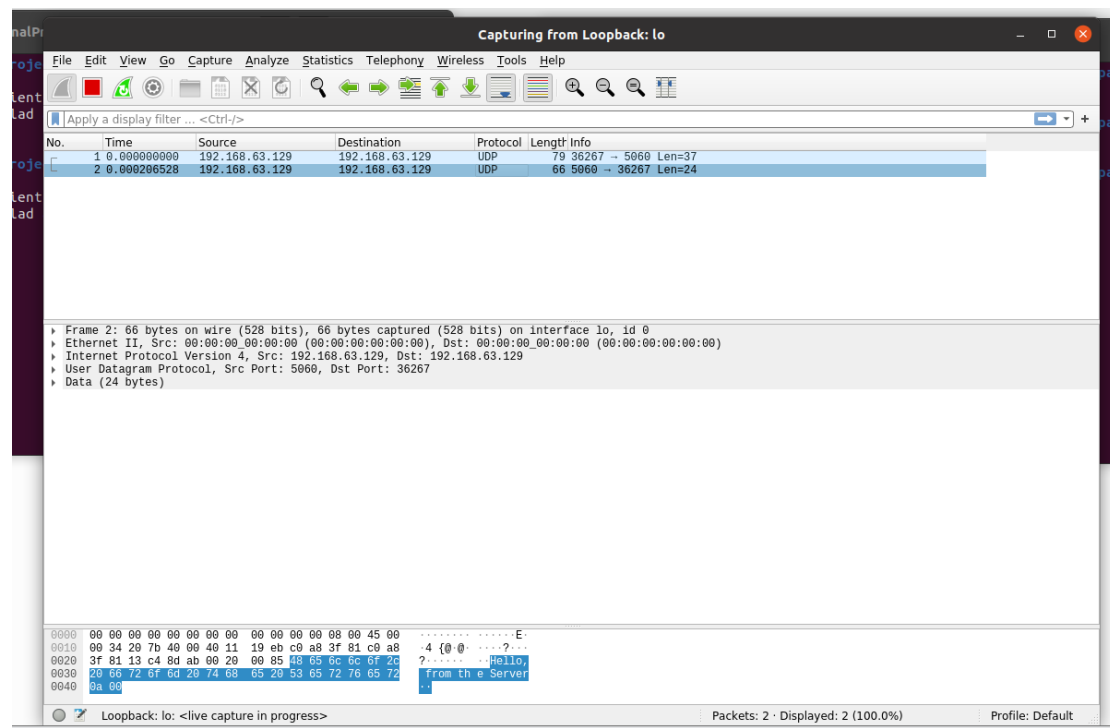
```
elad@ubuntu: ~/Desktop/finalProject/Communcation_final...
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ ./Udp
-Client
Hello, from the Server
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ ./Udp
-Client
Hello, from the Server
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ netst
at -an
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp6       0      0 :::1:631                :::*                    LISTEN
udp        0      0 0.0.0.0:631             0.0.0.0:*               LISTEN
udp        0      0 192.168.63.129:5060     0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:5353            0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:59580           0.0.0.0:*               LISTEN
udp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN
udp        0      0 192.168.63.129:68       192.168.63.254:67      ESTABLISHED
udp6       0      0 :::5353                 :::*                    LISTEN
udp6       0      0 :::57183                 :::*                    LISTEN
raw6       0      0 :::58                    :::*                    LISTEN
7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags               Type               State         I-Node     Path
```

קבלת הפאקטות מ IP הנדרש :

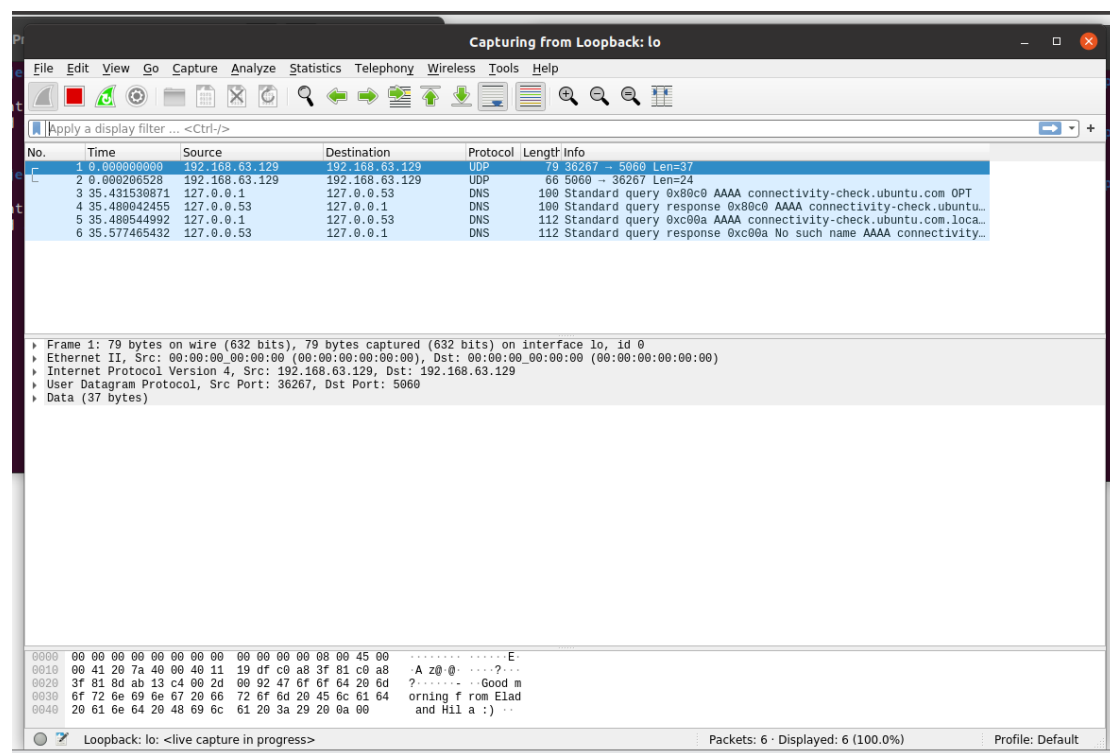
```
elad@ubuntu:~/Desktop/finalProject/Communcation_final...
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ ./Udp
-Server
After bind(). Waiting for clientsReceived packet from 192.168.63.129:55320
Data is: Good morning from Elad and Hila :)

elad@ubuntu:~/Desktop/finalProject/Communcation_final...
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ ./Udp
-Client
Hello, from the Server
elad@ubuntu:~/Desktop/finalProject/Communcation_finalProject-main/part b$ S
```

האזנה של Src port ל5060:



האזנה של Dst port ל5060:



מעבר ל IPv6 :

```
elad@ubuntu: ~/Desktop/finalProject/Communucation_final...
Try: sudo apt install <deb name>

elad@ubuntu:~/Desktop/finalProject/Communucation_finalProject-main/part b$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.63.129 netmask 255.255.255.0 broadcast 192.168.63.255
    inet6 fe80::b2e7:837f:c4b1:f594 prefixlen 64 scopeid 0x20<link>
    ether 00:0c:29:af:e8:df txqueuelen 1000 (Ethernet)
    RX packets 186391 bytes 235583290 (235.5 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 82916 bytes 5537784 (5.5 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 3057 bytes 300393 (300.3 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 3057 bytes 300393 (300.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

elad@ubuntu:~/Desktop/finalProject/Communucation_finalProject-main/part b$ S
```

netstat -an עם פקודת IPv6 :

```
elad@ubuntu: ~/Desktop/finalProject/Communucation_fina...
elad@ubuntu:~/Desktop/finalProject/Communucation_finalProject-main/part b$ netstat -an
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
tcp6       0      0 :::1:631                :::*                    LISTEN
udp        0      0 0.0.0.0:631             0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:5353            0.0.0.0:*               LISTEN
udp        0      0 0.0.0.0:59580           0.0.0.0:*               LISTEN
udp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN
udp        0      0 192.168.63.129:68       192.168.63.254:67      ESTABLISHED
udp6       0      0 :::5060                 :::*                    LISTEN
udp6       0      0 :::5353                 :::*                    LISTEN
udp6       0      0 :::57183                 :::*                    LISTEN
raw6       0      0 :::58                   :::*                    LISTEN
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags       Type       State         I-Node      Path
unix   2      [ ACC ]     STREAM    LISTENING    410047      @/tmp/dbus-psjWpx1
unix   2      [ ACC ]     STREAM    LISTENING    49820       @/tmp/.ICE-unix/1698
unix   2      [ ACC ]     SEQPACKET LISTENING    24996       /run/udev/control
unix   2      [ ACC ]     STREAM    LISTENING    253822      /run/systemd/userdb/
io.systemd.DynamicUser
unix   2      [ ACC ]     STREAM    LISTENING    654461      /tmp/CoreFxPipe_a078
```


ביצוע פקודת **send** תוך כדי מימוש פונקציית **discover**, קבלת ההודעת ה **discover** וה **payload** כנדרש. (ההודעה שנשלחה היא המילה **hi** באורך 2 מצומת מספר 2 לצומת מספר 0 כאשר צומת מספר 1 ממש ומעביר הודעת **discover**)

```

hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_final
File Edit View Search Terminal Help
127.0.0.1
Successfully created a Node with ID = 0, Port = 5060, IP = 127.0.0.1

adding fd1(3) to monitoring
waiting for input...
fd: 3 is ready. reading...
adding fd1(4) to monitoring
Ack
waiting for input...
fd: 4 is ready. reading...
Connected to Node with ID = 1
Ack
waiting for input...
fd: 4 is ready. reading...
fd: 0 is ready. reading...
Successfully open a TCP socket.
adding fd1(4) to monitoring
Connected to Node with ID = 0
Ack
waiting for input...
fd: 3 is ready. reading...
adding fd1(5) to monitoring
Ack
waiting for input...
fd: 5 is ready. reading...
Connected to Node with ID = 2
Ack
waiting for input...
fd: 5 is ready. reading...
Ack
waiting for input...
fd: 5 is ready. reading...
Ack
waiting for input...

hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_final
File Edit View Search Terminal Help
Please Enter Node IP:
127.0.0.1
Successfully created a Node with ID = 0, Port = 5062, IP = 127.0.0.1

adding fd1(3) to monitoring
waiting for input...
setid,2
fd: 0 is ready. reading...
Ack
waiting for input...
connect,127.0.0.1:5061
fd: 0 is ready. reading...
Successfully open a TCP socket.
adding fd1(4) to monitoring
Connected to Node with ID = 1
Ack
waiting for input...
send,0,2,hi
fd: 0 is ready. reading...
Ack
waiting for input...

```

ביצוע פקודת **peers** והדפסת הקודקודים המחוברים (השכנים).
קודקוד מספר 1 מחובר לקודקודים 0 ו 2 ולכן בפקודת **peers** הם מודפסים.

```

hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_finalProject/par
++ Main.cpp select.cpp
hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_finalProject/par
/a.out
Welcome! Now build a Node on the Network
Please Enter Node Port:
5060
Please Enter Node IP:
127.0.0.1
Successfully created a Node with ID = 0, Port = 5060, IP = 127.0.0.1

adding fd1(3) to monitoring
waiting for input...
fd: 3 is ready. reading...
adding fd1(4) to monitoring
Ack
waiting for input...
fd: 4 is ready. reading...
Connected to Node with ID = 1
Ack
waiting for input...

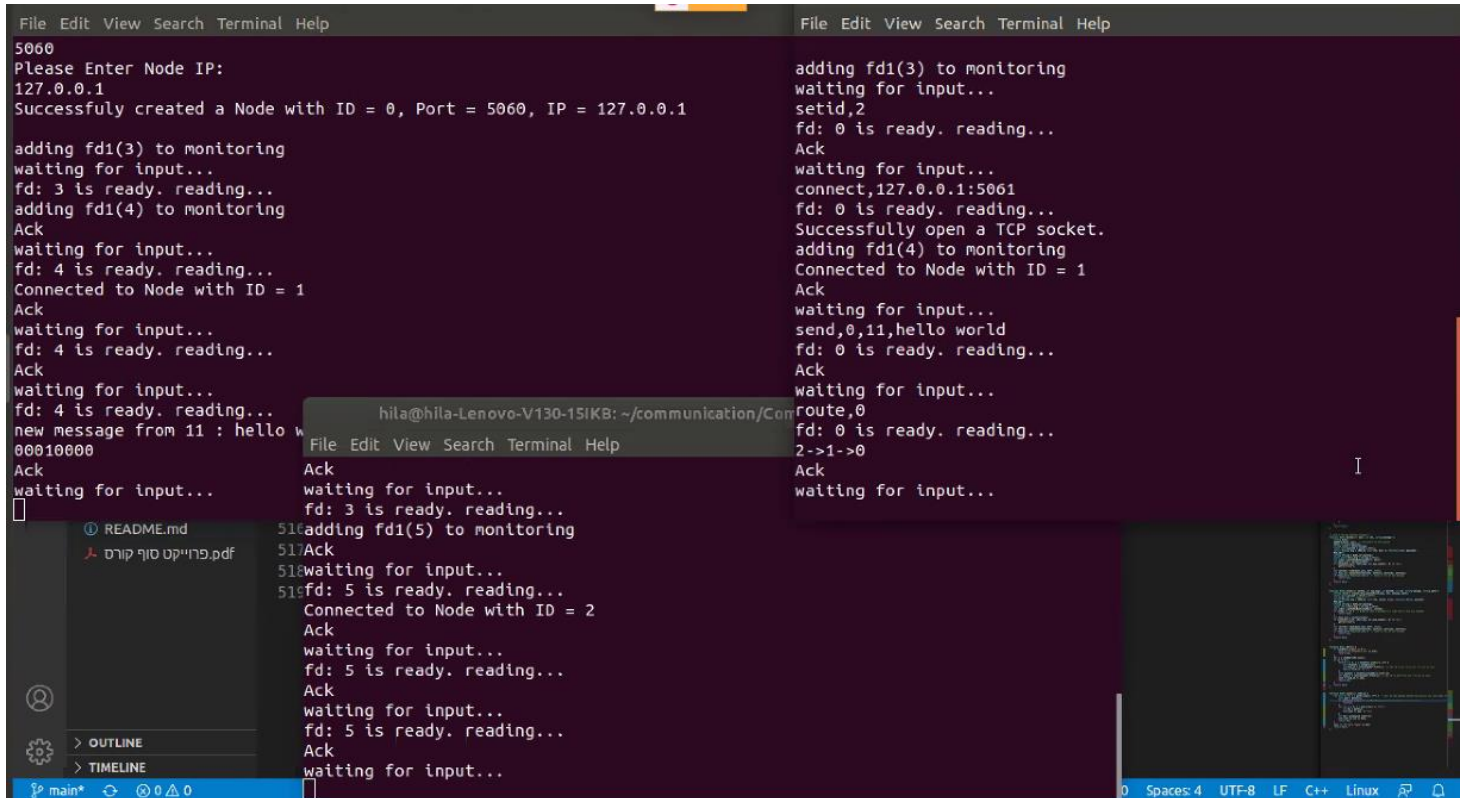
hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_finalProject/par
Welcome! Now build a Node on the Network
Please Enter Node Port:
5062
Please Enter Node IP:
127.0.0.1
Successfully created a Node with ID = 0, Port = 5062, IP = 127.0.0.1

adding fd1(3) to monitoring
waiting for input...
setid,2
fd: 0 is ready. reading...
command_name: setid
Ack
waiting for input...
connect,127.0.0.1:5061
fd: 0 is ready. reading...
command_name: connect
Successfully open a TCP socket.
adding fd1(4) to monitoring
Connected to Node with ID = 1
Ack
waiting for input...

hila@hila-Lenovo-V130-15IKB: ~/communication/Communcation_finalProject/par
48
48waiting for input...
48fd: 5 is ready. reading...
48Connected to Node with ID = 2
48Ack
48waiting for input...
49peers
49fd: 0 is ready. reading...
49command_name: peers
49
490,2
49Ack
49waiting for input...

```

ביצוע פקודת **route** לאחר יצירת מסלול בין שלושת הקודקודים הנ"ל (בעזרת פונקציית **send** שמשמשת בפונקציית **discover**) והחזרת המסלול המבוקש.



```
File Edit View Search Terminal Help
5060
Please Enter Node IP:
127.0.0.1
Successfully created a Node with ID = 0, Port = 5060, IP = 127.0.0.1

adding fd1(3) to monitoring
waiting for input...
fd: 3 is ready. reading...
adding fd1(4) to monitoring
Ack
waiting for input...
fd: 4 is ready. reading...
Connected to Node with ID = 1
Ack
waiting for input...
fd: 4 is ready. reading...
Ack
waiting for input...
fd: 4 is ready. reading...
new message from 11 : hello w
00010000
Ack
waiting for input...
[

hila@hila-Lenovo-V130-151KB: ~/communication/Com
File Edit View Search Terminal Help
Ack
waiting for input...
fd: 3 is ready. reading...
516adding fd1(5) to monitoring
517Ack
518waiting for input...
519fd: 5 is ready. reading...
Connected to Node with ID = 2
Ack
waiting for input...
fd: 5 is ready. reading...
Ack
waiting for input...
fd: 5 is ready. reading...
Ack
waiting for input...

adding fd1(3) to monitoring
waiting for input...
setid,2
fd: 0 is ready. reading...
Ack
waiting for input...
connect,127.0.0.1:5061
fd: 0 is ready. reading...
Successfully open a TCP socket.
adding fd1(4) to monitoring
Connected to Node with ID = 1
Ack
waiting for input...
send,0,11,hello world
fd: 0 is ready. reading...
2->1->0
Ack
waiting for input...
route,0
fd: 0 is ready. reading...
2->1->0
Ack
waiting for input...

I

0 Spaces: 4 UTF-8 LF C++ Linux
```

התמודדות עם מעגל : יצרנו שלושה קודקודים (בעלי המזהים 0,1,2) חיברנו אותם ויצרנו מעגל.

לאחר מכן עם שלחנו את המילה "hi" באורך 2 וכך יצרנו מסלול בעזרת פונקציית discover.

לבסוף עם פקודת route הדפסנו את המסלול כך שגם ההודעה מתקבלת מהקודקוד ששלחנו ממנו.

```
File Edit View Search Terminal Help
adding fd1(4) to monitoring
Ack
waiting for input...
fd: 4 is ready. reading...
Connected to Node with ID = 1
Ack
waiting for input...
fd: 3 is ready. reading...
adding fd1(5) to monitoring
Ack
waiting for input...
fd: 5 is ready. reading...
Connected to Node with ID = 2
Ack
waiting for input...
fd: 5 is ready. reading...
Ack
waiting for input...
fd: 5 is ready. reading...
new message from 2 : hi
Ack
waiting for input...
[ ]

hila@hila-Lenovo-V130-15IKB: ~/communication
File Edit View Search Terminal Help
waiting for input...
connect,127.0.0.1:5060
fd: 0 is ready. reading...
Successfully open a TCP socket.
adding fd1(4) to monitoring
Connected to Node with ID = 0
Ack
waiting for input...
fd: 3 is ready. reading...
adding fd1(5) to monitoring
Ack
waiting for input...
fd: 5 is ready. reading...
Connected to Node with ID = 2
Ack
waiting for input...
[ ]

File Edit View Search Terminal Help
connect,127.0.0.1:5061
fd: 0 is ready. reading...
Successfully open a TCP socket.
adding fd1(5) to monitoring
Connected to Node with ID = 1
Ack
waiting for input...
send,0,2,hi
fd: 0 is ready. reading...
Ack
waiting for input...
route,0
fd: 0 is ready. reading...
2->0
Ack
waiting for input...
[ ]
```

קישור לפרוייקט בGitHub : https://github.com/HilaShoshan/Communucation_finalProject.git