Ex5_comm:

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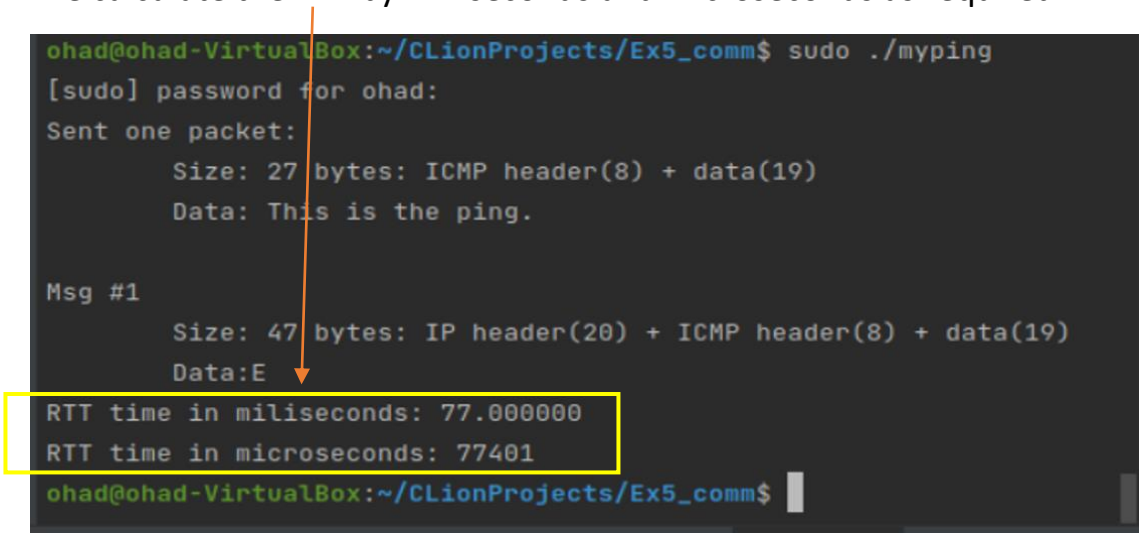
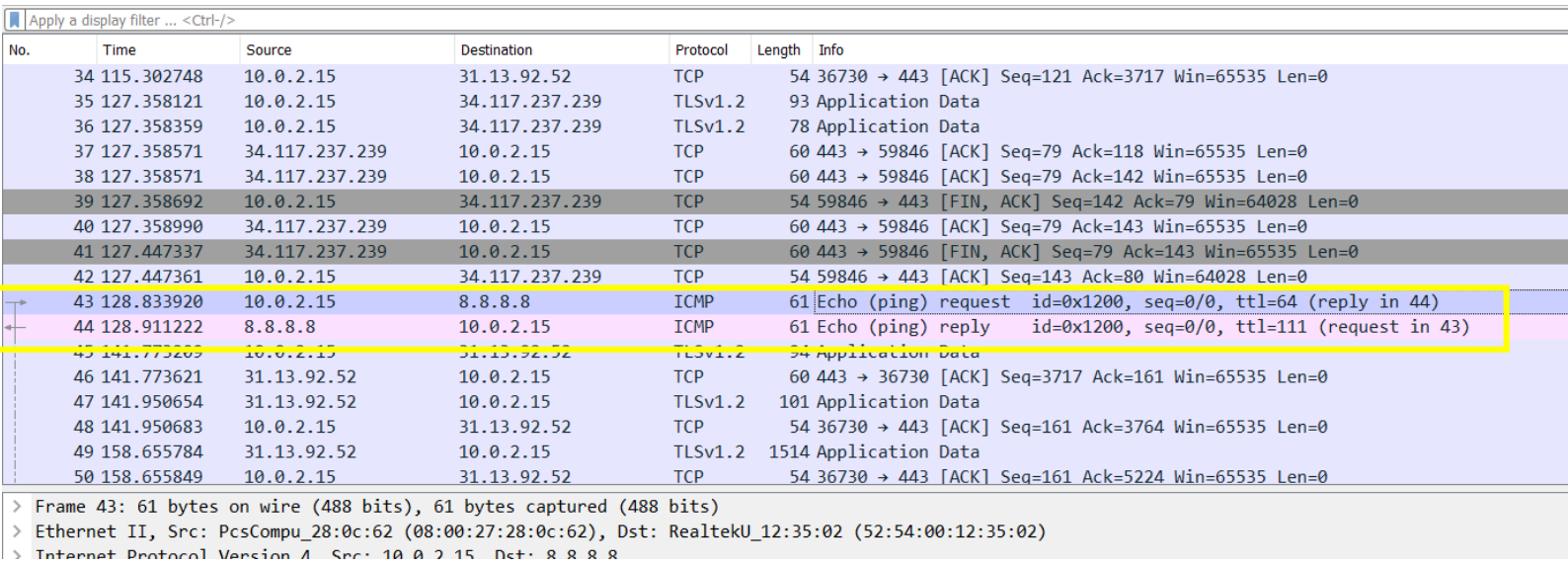
We will explain both parts of the exercise together:

On part A "myping" we sent a "ping" to 8.8.8.8 (Google address) and wait for a Echo Reply.
We started measure the time when we sent the ping to 8.8.8.8 and finished the measurement when we got the Echo Reply.

We calculate the RTT by milliseconds and microseconds as required.



We can also see all this data from the Wireshark:



Wireshark · Packet 43 · Ex5.ping_sniffer.pcap

```
> Frame 43: 61 bytes on wire (488 bits), 61 bytes captured (488 bits)
> Ethernet II, Src: PcsCompu_28:0c:62 (08:00:27:28:0c:62), Dst: RealtekU_12:35:02 (52:54:00:12:35:02)
> Internet Protocol Version 4, Src: 10.0.2.15, Dst: 8.8.8.8
v Internet Control Message Protocol
    Type: 8 (Echo (ping) request)
    Code: 0
    Checksum: 0xae36 [correct]
    [Checksum Status: Good]
    Identifier (BE): 4608 (0x1200)
    Identifier (LE): 18 (0x0012)
    Sequence Number (BE): 0 (0x0000)
    Sequence Number (LE): 0 (0x0000)
    [Response frame: 44]
  v Data (19 bytes)
      Data: 546869732069732074686520706696e672e0a00
      [Length: 19]
```

```
0000  52 54 00 12 35 02 08 00  27 28 0c 62 08 00 45 00   RT··5··· '(·b··E·
0010  00 2f e6 3f 40 00 40 01  38 70 0a 00 02 0f 08 08   ·/·?@·@· 8p·····
0020  08 08 08 00 ae 36 12 00  00 00 54 68 69 73 20 69   ·····6·· ··This i
0030  73 20 74 68 65 20 70 69  6e 67 2e 0a 00           s the pi ng.··
```

Here we can see all the data that we showed up before.
The kernel of the code (send and receive the ping):

```c
//*************************** Send the ICMP ECHO REQUEST packet: ****************************//
int size_sent;

struct timeval start, end; // ****** start time ********
gettimeofday(&start, NULL);

size_sent = sendto(sock, packet,  ICMP_HDRLEN + datalen, 0, (struct sockaddr *) &dest_in,sizeof(dest_in));
if (size_sent == -1) {
    fprintf(stderr, "sendto() failed with error: %d", errno);
    return -1;
}
printf("Sent one packet:\n");
printf("\tSize: %d bytes: ICMP header(%d) + data(%d)\n", size_sent, ICMP_HDRLEN, datalen);
printf("\tData: %s \n", packet + ICMP_HDRLEN);

// ********************** Receive the ICMP ECHO REPLY packet: ***********************************//
int cnt = 1;
bzero(&packet, sizeof(packet));
socklen_t len = sizeof(dest_in);
int size_recv = -1;
while (size_recv < 0) {
    size_recv = recvfrom(sock, packet, sizeof(packet), 0, (struct sockaddr *) &dest_in, &len);
}
printf("Msg #%d\n", cnt);
printf("\tSize: %d bytes: IP header(%d) + ICMP header(%d) + data(%d)\n", size_recv, IP4_HDRLEN, ICMP_HDRLEN,
       datalen);
printf("\tData:%s\n",packet);
```

On Part B "sniffer"- we created a sniffer for ICMP Packets.

We turned on the sniffer before activated the prog- "myping"
in order to sniff the Echo request and Echo reply of "myping",
Then we "ping" 8.8.8.8 from the terminal to sniff more ICMP Packets.

```
ohad@ohad-VirtualBox:~/CLionProjects/Ex5_comm$ sudo ./sniffer
[sudo] password for ohad:


****************** ICMP Packet number #1 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 - Echo Request
ICMP Echo code is: 0


****************** ICMP Packet number #2 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 - Echo Reply
ICMP Echo code is: 0
```

(myping ICMP Packets)

```
ohad@ohad-VirtualBox:~/CLionProjects/Ex5_comm$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=111 time=76.8 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=111 time=78.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=111 time=78.4 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=111 time=85.0 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=111 time=76.8 ms
^C
--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4005ms
rtt min/avg/max/mdev = 76.819/79.100/84.982/3.027 ms
```

```
****************** ICMP Packet number #3 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 - Echo Request
ICMP Echo code is: 0


****************** ICMP Packet number #4 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 - Echo Reply
ICMP Echo code is: 0


****************** ICMP Packet number #5 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 - Echo Request
ICMP Echo code is: 0
```

```
****************** ICMP Packet number #6 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 - Echo Reply
ICMP Echo code is: 0


****************** ICMP Packet number #7 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 - Echo Request
ICMP Echo code is: 0


****************** ICMP Packet number #8 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 - Echo Reply
ICMP Echo code is: 0


****************** ICMP Packet number #9 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 - Echo Request
ICMP Echo code is: 0
```

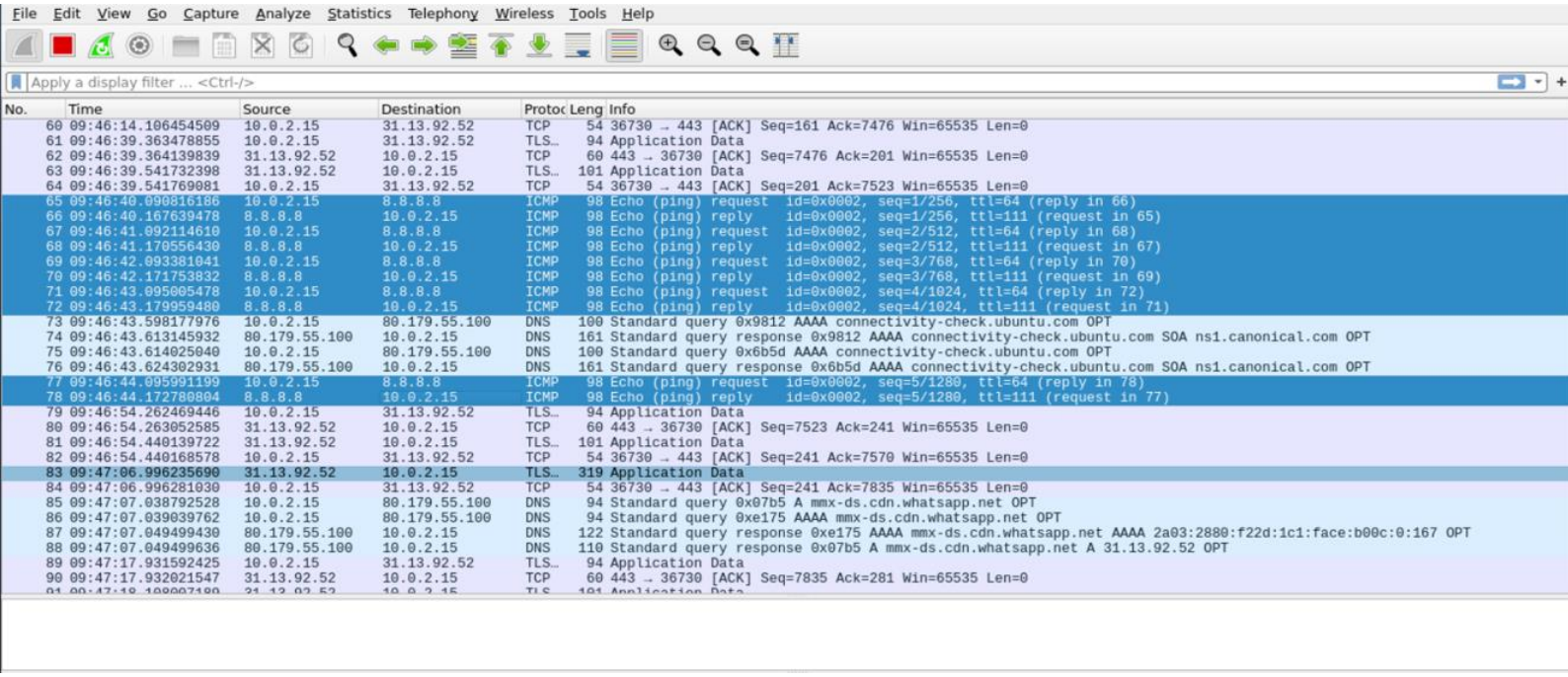
```
****************** ICMP Packet number #10 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 – Echo Reply
ICMP Echo code is: 0


****************** ICMP Packet number #11 ******************
Source IP is: 10.0.2.15
Destination IP is: 8.8.8.8
ICMP Echo type is: Type 8 – Echo Request
ICMP Echo code is: 0


****************** ICMP Packet number #12 ******************
Source IP is: 8.8.8.8
Destination IP is: 10.0.2.15
ICMP Echo type is: Type 0 – Echo Reply
ICMP Echo code is: 0
```

(all the 10 ICMP Packets – 5 of Request and 5 of Reply)

We can also see all this data from the Wireshark:



Turn on the promiscuous mode:

```
// ************* Turn on the promiscuous mode (on which interface to work) *************
    struct packet_mreq mr;
    mr.mr_type = PACKET_MR_PROMISC;
//    SOL_PACKET -->> to manipulate options at the socket api level
//                    that means: you can set up and establish connections to other users on the network
//                                send and receive data to and from other users
//                                close down connections
//    PACKET_ADD_MEMBERSHIP -->> adds a binding
    setsockopt(raw_sock, SOL_PACKET, PACKET_ADD_MEMBERSHIP, &mr, sizeof(mr));
```

Function to get the ICMP Packet header (as required):

```
void get_icmp_packet(unsigned char* buffer, int buffer_size){
    char *types[]={"Type 0 – Echo Reply",
                   "Type 1 – Unassigned",
                   "Type 2 – Unassigned",
                   "Type 3 – Destination Unreachable",
                   "Type 4 – Source Quench (Deprecated)",
                   "Type 5 – Redirect",
                   "Type 6 – Alternate Host Address (Deprecated)",
                   "Type 7 – Unassigned",
                   "Type 8 – Echo Request",
                   "Type 9 – Router Advertisement",
                   "Type 10 – Router Selection"};
    unsigned short ip_hdr_len;
    struct iphdr *iph = (struct iphdr *)(buffer+ETH_HLEN);
    if (iph->protocol== IPPROTO_ICMP) {
        ip_hdr_len = iph->ihl * 4;
        struct icmphdr *icmph = (struct icmphdr *) (buffer + ip_hdr_len +ETH_HLEN);

     if ((unsigned int) (icmph->type) < 11) {
         struct sockaddr_in src;
         memset(&src, 0, sizeof(src));
         src.sin_addr.s_addr = iph->saddr;

         struct sockaddr_in dest;
         memset(&dest, 0, sizeof(dest));
         dest.sin_addr.s_addr = iph->daddr;


         printf("\n");

         printf("\n****************** ICMP Packet number #%d ******************\n", counter);
         printf("Source IP is: %s\n", inet_ntoa(src.sin_addr));
         printf("Destination IP is: %s\n", inet_ntoa(dest.sin_addr));
         printf("ICMP Echo type is: %s\n", types[icmph->type]);
         printf("ICMP Echo code is: %d\n", icmph->code);
         counter++;
     }
  }
```

This is how we deal with any packet we got,
we check if its ICMP Packet and filtered the relevants fields.