IERG4180 Network Software Design and Programming
Project 1 Report

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GitHub Repository: https://github.com/Catalpa1maple/IERG4180-Project

ALL three mode: SEND, RECV and HOST are completed
SEND with default setting

```
luser@ub125:~/Desktop/IERG4180-Project$ ./NetProbe -send -lhost 0.0.0.0
lhost: 0.0.0.0
localhost resolved to: 127.0.0.1
UDP socket created and connected to 1:4180
Elapsed 0.5s Rate 8.0Mbps
Elapsed 1.0s Rate 8.0Mbps
Elapsed 1.5s Rate 8.0Mbps
Elapsed 2.0s Rate 8.0Mbps
```

With specified parameters

```
maplewong@Maples-Mac IERG4180 % ./NetProbe -send  -rport 8000 -rhost 0.0.0.0 -pktrat
e 800 -pktnum 5 -pktsize 800 -sbufsize 800 -stat 1000
rport: 8000
rhost: 0.0.0.0
pktrate: 800
pktnum: 5
pktsize: 800
sbufsize: 800
stat: 1000
0.0.0.0 resolved to: 0.0.0.0
UDP socket created and connected to 0:8000
Elapsed 1.0s Rate 6.4Mbps
Elapsed 2.0s Rate 6.4Mbps
Elapsed 3.0s Rate 6.4Mbps
Elapsed 4.0s Rate 6.4Mbps
Elapsed 5.0s Rate 6.4Mbps
Data sent: 4000 bytes
```

RECV with default setting

```
luser@ub125:~/Desktop/IERG4180-Project$ ./NetProbe -recv
UDP socket created and bound to IN_ADDR_ANY:4180
Elapsed 0.5s Pkts 1 Lost 0, 0.0% Rate 0.2Kbps Jitter 0ms
Elapsed 1.0s Pkts 2 Lost 0, 0.0% Rate 7.9Kbps Jitter 0ms
Elapsed 1.5s Pkts 3 Lost 0, 0.0% Rate 7.9Kbps Jitter 0ms
Elapsed 2.0s Pkts 4 Lost 0, 0.0% Rate 7.9Kbps Jitter 0ms
```

With specified parameters

```
maplewong@Maples-Mac IERG4180 % ./NetProbe -recv -lhost 0.0.0.0 -lport 8000 -rbufsize 1000 -pkt
size 800
lhost: 0.0.0.0
lport: 8000
rbufsize: 1000
pktsize: 800
0.0.0.0 resolved to: 0.0.0.0
UDP socket created and bound to 0:8000
500000
Elapsed 0.5s Pkts 1 Lost 0, 0.0% Rate 4.1Kbps Jitter 0ms
500000.0
Elapsed 1.0s Pkts 2 Lost 0, 0.0% Rate 5.4Kbps Jitter 0ms
500000.0
Elapsed 1.5s Pkts 3 Lost 0, 0.0% Rate 5.3Kbps Jitter 0ms
500000.0
Elapsed 2.0s Pkts 4 Lost 0, 0.0% Rate 5.3Kbps Jitter 0ms
500000.0
Elapsed 2.5s Pkts 5 Lost 0, 0.0% Rate 5.3Kbps Jitter 0ms
```

HOST mode demo

HOST mode can resolve domain (Google and IE) to IP address including localhost.

```
● maplewong@Maples-Mac IERG4180 % ./NetProbe -host -host www.google.com
  www.google.com resolved to: 172.217.27.36
● maplewong@Maples-Mac IERG4180 % ./NetProbe -host -host www.ie.cuhk.edu.hk
  www.ie.cuhk.edu.hk resolved to: 137.189.99.7
● maplewong@Maples-Mac IERG4180 % ./NetProbe -host -host localhost
  localhost resolved to: 127.0.0.1
○ maplewong@Maples-Mac IERG4180 %
```

Implementation: mainly depends on getaddrinfo() function with cpp

```cpp
char getHost(std::string& host){
    struct addrinfo hints, *res;
    memset(&hints, 0, sizeof(hints));
    hints.ai_family = AF_INET;
    hints.ai_socktype = SOCK_STREAM;

    int status = getaddrinfo(host.c_str(), nullptr, &hints, &res);
    if (status != 0) {
        std::cerr << "getaddrinfo: " << gai_strerror(status) << std::endl;
        return EXIT_FAILURE;
    }

    char ipstr[INET_ADDRSTRLEN];
    for (struct addrinfo* p = res; p != nullptr; p = p->ai_next) {
        void* addr = &((struct sockaddr_in*)p->ai_addr)->sin_addr;
        inet_ntop(p->ai_family, addr, ipstr, sizeof(ipstr));
        std::cout << host << " resolved to: " << ipstr << std::endl;
    }
    return *ipstr;
}
```

Experiment Result
1. Rate 7.1Mbps Jitter 4.1ms (n = 6)
   Rate 5.5Mbps Jitter 4.2ms (n = 8)
   Rate 6.5Mbps Jitter 3.3ms (n = 10)
   Rate 3.2Mbps Jitter 1.2ms (n = 12)
   Rate 2.9Mbps Jitter 4.4ms (n = 13)
   Rate 2.1Mbps Jitter 5.1ms (n = 14)
   Rate 1.9Mbps Jitter 7.3ms (n = 15)
   Rate 2.3Mbps Jitter 11.3ms (n = 16)

2. It is quite surprised that there were no packet loss when I run and transmitting at localhost

3. It is obvious that the receiver socket buffer size is the celling for throughput, when the buffer size is not large enough and is fully occupied that receiver can't not receive data anymore. Therefore that the receiver cannot receiver from OS layer and it suggests that the packet is lost in cyber space and occurs packet loss.