Assignment 3

Eavesdrop attack

Roll no.C16

An eavesdrop attack (passive sniffing) is when an attacker listens to network traffic between two hosts to intercept sensitive data (messages, credentials, etc.) without altering the traffic. Unencrypted protocols (plain UDP/TCP) are vulnerable because packet payloads can be read by anyone capturing the link.

Tools & environment used

- **OS:** Linux(VirtualBox)
- **CPP** (for UDP client/server)
- tcpdump

Code:#

```
mkdir -p ~/udp-
eavesdrop && cd
~/udp-eavesdrop

# Server
cat > UDPServer.cpp
<<'EOF'
#include <iostream>
#include <cstring>
#include <arpa/inet.h>
#include <unistd.h>

#define
BUFFER_SIZE 1024
```

```
std::string
caesar_decrypt(const
std::string &s, int shift)
{
    std::string out = s;
    shift = shift % 26;
    for (size_t i = 0; i <
out.size(); ++i) {
        char c = out[i];
        if (c >= 'A' && c
<= 'Z') {
            out[i] = char((c
- 'A' - shift + 26) % 26
+ 'A');
        } else if (c >= 'a'
&& c <= 'z') {
            out[i] = char((c
- 'a' - shift + 26) % 26
+ 'a');
        } else {
            // leave other
characters as-is
(spaces, punctuation,
digits)
            out[i] = c;
        }
    }
    return out;
}

std::string
caesar_encrypt(const
std::string &s, int shift)
{
    std::string out = s;
    shift = shift % 26;
    for (size_t i = 0; i <
out.size(); ++i) {
        char c = out[i];
```

```
        if (c >= 'A' && c
<= 'Z') {
            out[i] = char((c
- 'A' + shift + 26) % 26
+ 'A');
        } else if (c >= 'a'
&& c <= 'z') {
            out[i] = char((c
- 'a' + shift + 26) % 26
+ 'a');
        } else {
            out[i] = c;
        }
    }
    return out;
}

int main(int argc,
char* argv[]) {
    int port = 9876; //
default port
    int shift = 3;    //
default Caesar shift
    if (argc > 1) port =
atoi(argv[1]);
    if (argc > 2) shift =
atoi(argv[2]);

    int sockfd;
    struct sockaddr_in
serverAddr,
clientAddr;
    char
buffer[BUFFER_SIZE]
;
    socklen_t addrLen
= sizeof(clientAddr);

    if ((sockfd =
socket(AF_INET,
```

```
SOCK_DGRAM, 0)) <
0) {
        perror("Socket
creation failed");

exit(EXIT_FAILURE);
    }


serverAddr.sin_family
= AF_INET;

serverAddr.sin_addr.s
_addr =
INADDR_ANY;
    serverAddr.sin_port
= htons(port);

    if (bind(sockfd,
(const struct
sockaddr*)&serverAd
dr, sizeof(serverAddr))
< 0) {
        perror("Bind
failed");
        close(sockfd);

exit(EXIT_FAILURE);
    }

    std::cout << "UDP
server running on port
" << port << " with
Caesar shift " << shift
              << " (type
'exit' from client to
stop)\n";

    while (true) {
        memset(buffer,
```

```
0, BUFFER_SIZE);
        int n =
recvfrom(sockfd,
buffer,
BUFFER_SIZE, 0,
(struct
sockaddr*)&clientAddr
, &addrLen);
        if (n < 0) {

perror("recvfrom
failed");
            continue;
        }

        std::string
encrypted_msg(buffer
, n);
        std::string
decrypted_msg =
caesar_decrypt(encry
pted_msg, shift);

        std::cout <<
"Received
(ciphertext): '" <<
encrypted_msg << "'
from "
                  <<
inet_ntoa(clientAddr.si
n_addr) << ":" <<
ntohs(clientAddr.sin_p
ort) << "\n";
        std::cout <<
"Decrypted (plaintext):
'" << decrypted_msg
<< "'\n";

        if
(decrypted_msg ==
```

```
"exit") {
            std::string
bye_plain = "Server
shutting down as
requested.";
            std::string
bye_encrypted =
caesar_encrypt(bye_p
lain, shift);
            sendto(sockfd,
bye_encrypted.c_str(),
bye_encrypted.size(),
0, (struct
sockaddr*)&clientAddr
, addrLen);
            std::cout <<
"Exit command
received. Shutting
down server.\n";
            break;
        }

        std::string
response_plain =
"Server ACK: " +
decrypted_msg;
        std::string
response_encrypted =
caesar_encrypt(respo
nse_plain, shift);
        sendto(sockfd,
response_encrypted.c
_str(),
response_encrypted.s
ize(), 0, (struct
sockaddr*)&clientAddr
, addrLen);
    }

    close(sockfd);
```

```
    return 0;
}
EOF

# Client UDP Client

cat > UDPClient.cpp
<<'EOF'
#include <iostream>
#include <cstring>
#include <arpa/inet.h>
#include <unistd.h>

#define
BUFFER_SIZE 1024

std::string
caesar_encrypt(const
std::string &s, int shift)
{
    std::string out = s;
    shift = shift % 26;
    for (size_t i = 0; i <
out.size(); ++i) {
        char c = out[i];
        if (c >= 'A' && c
<= 'Z') {
            out[i] = char((c
- 'A' + shift + 26) % 26
+ 'A');
        } else if (c >= 'a'
&& c <= 'z') {
            out[i] = char((c
- 'a' + shift + 26) % 26
+ 'a');
        } else {
            out[i] = c;
        }
    }
    return out;
```

```
}

std::string
caesar_decrypt(const
std::string &s, int shift)
{
    std::string out = s;
    shift = shift % 26;
    for (size_t i = 0; i <
out.size(); ++i) {
        char c = out[i];
        if (c >= 'A' && c
<= 'Z') {
            out[i] = char((c
- 'A' - shift + 26) % 26
+ 'A');
        } else if (c >= 'a'
&& c <= 'z') {
            out[i] = char((c
- 'a' - shift + 26) % 26
+ 'a');
        } else {
            out[i] = c;
        }
    }
    return out;
}

int main(int argc,
char* argv[]) {
    const char*
serverIP =
"127.0.0.1";
    int serverPort =
9876;
    int shift = 3; //
default Caesar shift

    if (argc >= 2)
serverIP = argv[1];
```

```
    if (argc >= 3)
serverPort =
atoi(argv[2]);
    if (argc >= 4) shift =
atoi(argv[3]);

    int sockfd;
    struct sockaddr_in
serverAddr;
    char
buffer[BUFFER_SIZE]
;

    if ((sockfd =
socket(AF_INET,
SOCK_DGRAM, 0)) <
0) {
        perror("Socket
creation failed");

exit(EXIT_FAILURE);
    }


serverAddr.sin_family
= AF_INET;
    serverAddr.sin_port
= htons(serverPort);
    inet_pton(AF_INET,
serverIP,
&serverAddr.sin_addr
);

    socklen_t addrLen
= sizeof(serverAddr);

    std::cout << "UDP
client started. Sending
to " << serverIP << ":"
<< serverPort
```

```
            << " with
Caesar shift " << shift
<< "\n";
    std::cout << "Type
messages and press
Enter. Type 'exit' to
stop server and
exit.\n";

    while (true) {
        std::cout <<
"You: ";
        std::string plain;

std::getline(std::cin,
plain);

        std::string
encrypted =
caesar_encrypt(plain,
shift);
        sendto(sockfd,
encrypted.c_str(),
encrypted.size(), 0,
(struct
sockaddr*)&serverAd
dr, addrLen);

        int n =
recvfrom(sockfd,
buffer,
BUFFER_SIZE, 0,
(struct
sockaddr*)&serverAd
dr, &addrLen);
        if (n < 0) {

perror("recvfrom
error");
            break;
```

```
        }
        std::string
resp_encrypted(buffer
, n);
        std::string
resp_plain =
caesar_decrypt(resp_
encrypted, shift);

        std::cout <<
"Server (ciphertext): '"
<< resp_encrypted <<
"'\n";
        std::cout <<
"Server (decrypted): '"
<< resp_plain << "'\n";

        if (plain == "exit")
break;
    }

    close(sockfd);
    return 0;
}
EOF
```

Put `UDPServer.cpp` and `UDPClient.cpp` in the same folder, e.g.
mkdir -p ~/udp-eavesdrop && cd ~/udp-eavesdrop

Open **Command Prompt** (normal) and navigate to the folder

Compile

g++ UDPServer.cpp -o UDPServer

g++ UDPClient.cpp -o UDPClient

Run 3 terminals

Terminal 1 — server (runs on default port 9876 and shift 3)

```
cd ~/udp-eavesdrop
./UDPServer 9876 3
```

Terminal 2 — client:

```
cd ~/udp-eavesdrop
./UDPClient 127.0.0.1 9876 3
```

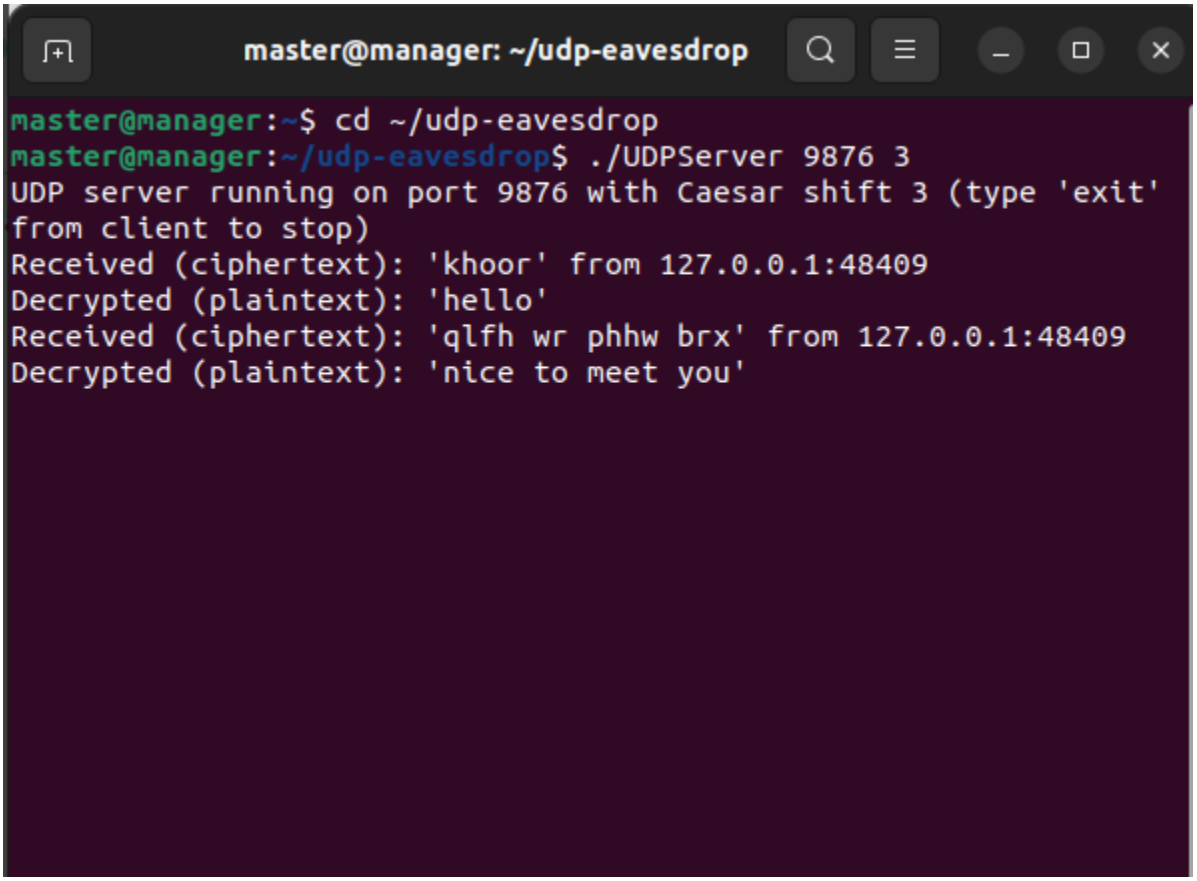
Type messages in the client. The client will show:

- the ciphertext sent (not shown to server; only sent),
- the server's ciphertext reply,
- and the decrypted server reply.
-

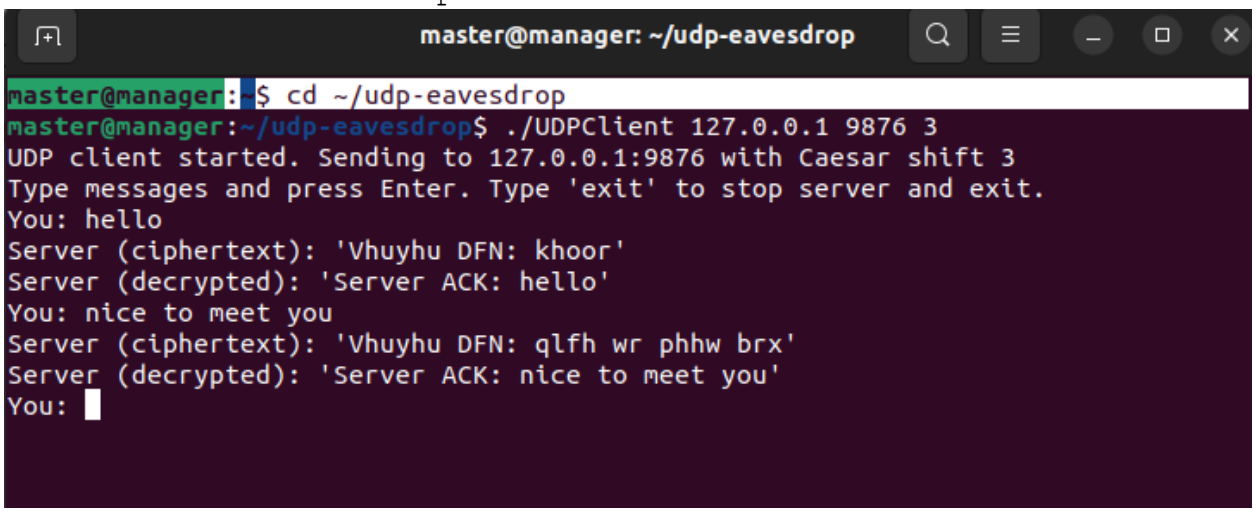
Terminal 3 — attacker (tcpdump)

```
sudo tcpdump -i lo -nn -s 0 udp port 9876 -A
```

1.server terminal output



2.Client terminal output



3. Attacker terminal output