Cryptography & Network Security Lab

SSL/TLS Lab

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Aim: To observe SSL/TLS (Secure Sockets Layer/ Transport Layer Security)in action. SSL/TLS is used to secure TCP connections, and it is widely used as part of the secure web:HTTPS is SSL over HTTP

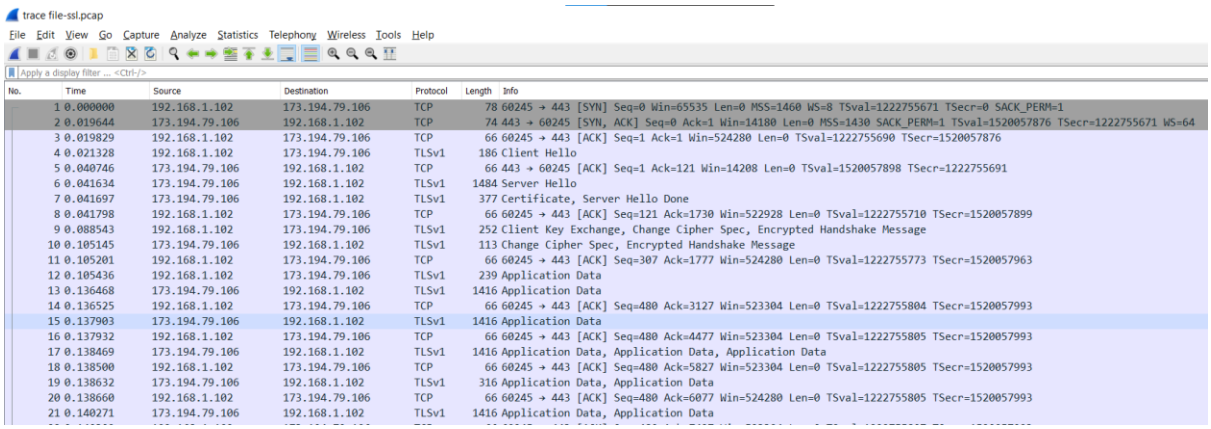
Theory: Secure Socket Layer (SSL) provides security to the data that is transferred between web browser and server. SSL encrypts the link between a web server and a browser which ensures that all data passed between them remain private and free from attack.

Secure Socket Layer Protocols:

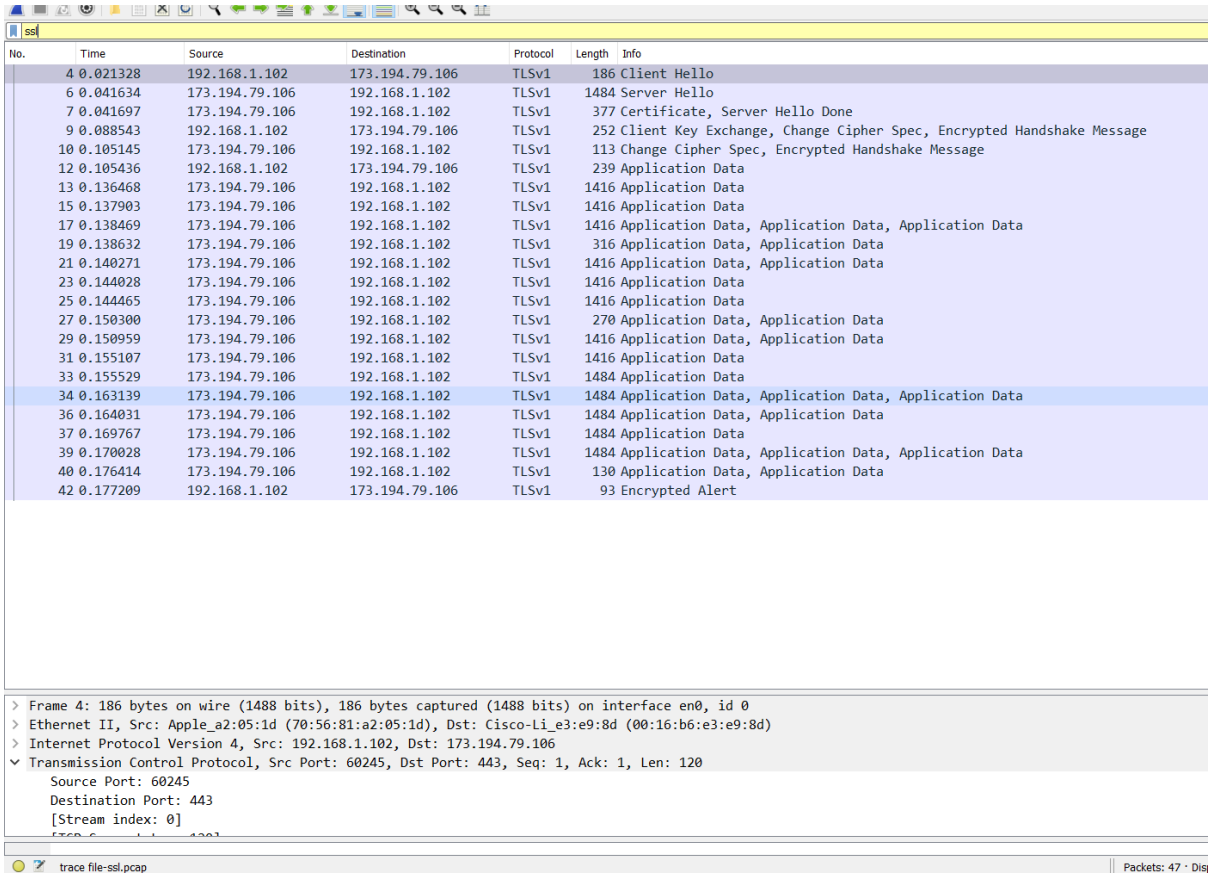
- SSL record protocol
- Handshake protocol
- Change-cipher spec protocol
- Alert protocol

Procedure:

STEP 1:Open a Trace you should use a supplied trace file trace-ssl.pcap.

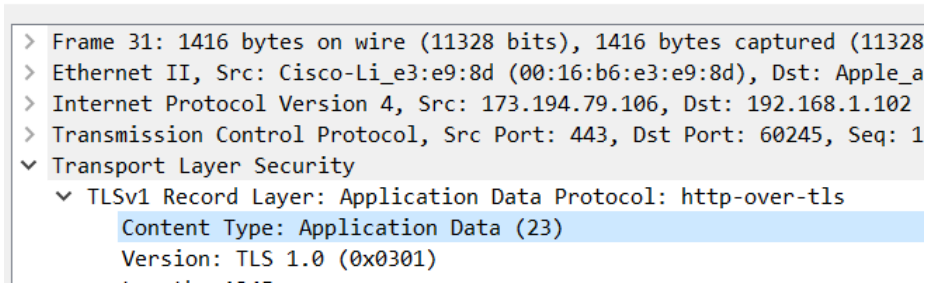


STEP 2:Inspect the Trace



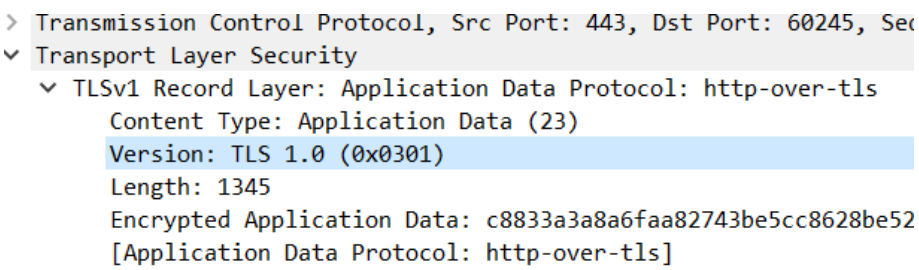
1. What is the Content Type for a record containing Application Data?

>> Content Type: Application Data (23)



2. What version constant is used in your trace, and which version of TLS does it represent?

>> **Version: TLS 1.0** (0x0301)



Step 3: The SSL Handshake

Hello Message

1. How long in bytes is the random data in the Hellos? Both the Client and Server include this random data (a nonce) to allow the establishment of session keys.

```
        Content Type: Handshake (22)
        Version: TLS 1.0 (0x0301)
        Length: 115
      ▼ Handshake Protocol: Client Hello
          Handshake Type: Client Hello (1)
          Length: 111
          Version: TLS 1.0 (0x0301)
        ▶ Random: 501778d316c25064f7cb0209b336ab332d969b8e091d26d4ccd04b731d7e550f
          Session ID Length: 0
          Cipher Suites Length: 46
        ▶ Cipher Suites (23 suites)
```

>>

Client Hello Random Data Length in bytes = **111**

```
▼ Transport Layer Security
  ▼ TLSv1 Record Layer: Handshake Protocol: Server Hello
      Content Type: Handshake (22)
      Version: TLS 1.0 (0x0301)
      Length: 85
    ▼ Handshake Protocol: Server Hello
        Handshake Type: Server Hello (2)
        Length: 81
        Version: TLS 1.0 (0x0301)
      ▶ Random: 501778d3d52d556ed20e072f638f0a51e9724d66ef5f13769d3a52e00161a893
```

Server Hello Random Data Length in bytes = **81**

2. How long in bytes is the session identifier sent by the server?This identifier allows later resumption of the session with an abbreviated handshake when both the client and server indicate the same value. In our case, the client likely sent no session ID as there was nothing to resume.

ANS:

```
    Content Type: Handshake (22)
    Version: TLS 1.0 (0x0301)
    Length: 85
  ▼ Handshake Protocol: Server Hello
      Handshake Type: Server Hello (2)
      Length: 81
      Version: TLS 1.0 (0x0301)
    ▶ Random: 501778d3d52d556ed20e072f638f0a51e9724d66ef5f13769d3a52e00161a893
      Session ID Length: 32
      Session ID: 8530bdac95116ccb343798b36cb2fd79c1e278cba1af41456c810c0cebfcccf4
      Cipher Suite: TLS_RSA_WITH_RC4_128_SHA (0x0005)
      Compression Method: null (0)
      Extensions Length: 9
```

Server Session ID: 8530bdac95116ccb343798b36cb2fd79c1e278cba1af41456c810c0cebfcccf4

3. What Cipher suite is chosen by the Server? Give its name and value. The Client will list the different cipher methods it supports, and the Server will pick one of these methods to use.

```
> Random: 501778d3d52d556ed20e072f638f0a51e9724d66ef5f13769d3a52e00161a893
  Session ID Length: 32
  Session ID: 8530bdac95116ccb343798b36cb2fd79c1e278cba1af41456c810c0cebfcccf4
  Cipher Suite: TLS_RSA_WITH_RC4_128_SHA (0x0005)
  Compression Method: null (0)
```

Cipher Suite: TLS_RSA_WITH_RCA_128_SHA

Certificate Messages

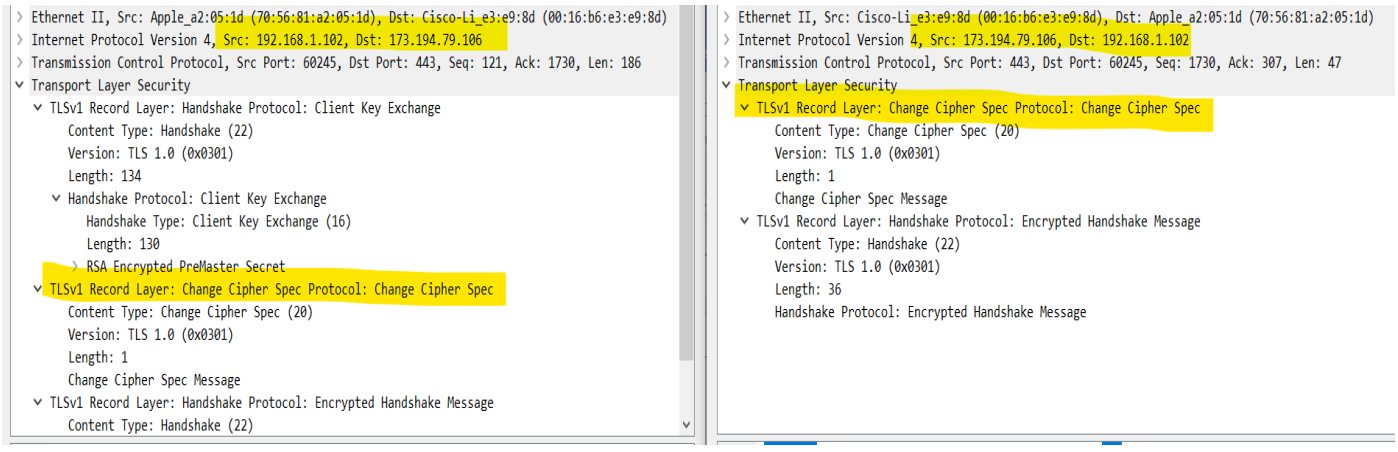
1. Who sends the Certificate, the client, the server, or both?A certificate is sent by one party to let the other party authenticate that it is who it claims to be. Based on this usage, you should be able to guess who sends the certificate and check the messages in your trace.

```
> Transmission Control Protocol, Src Port: 443, Dst Port: 60245, Sec
> [2 Reassembled TCP Segments (1630 bytes): #6(1328), #7(302)]
v Transport Layer Security
  v TLSv1 Record Layer: Handshake Protocol: Certificate
      Content Type: Handshake (22)
      Version: TLS 1.0 (0x0301)
      Length: 1625
    v Handshake Protocol: Certificate
        Handshake Type: Certificate (11)
        Length: 1621
        Certificates Length: 1618
      v Certificates (1618 bytes)
          Certificate Length: 805
        > Certificate: 308203213082028aa00302010202104f9d96d966b
          Certificate Length: 807
```

The Server sends the Certificate as the source port is 443, which is the server.

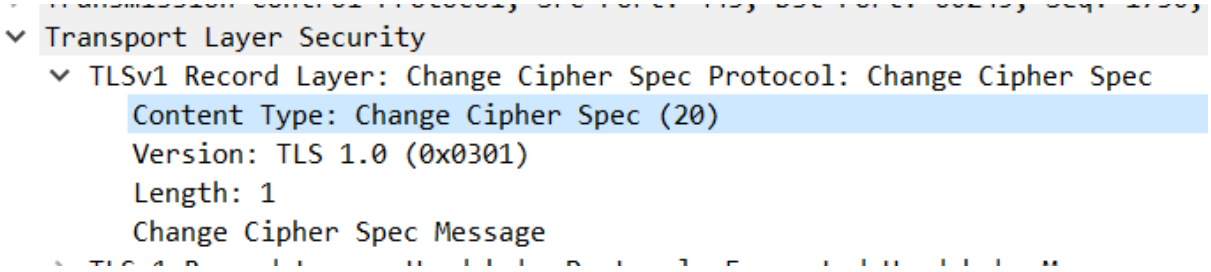
Client Key Exchange and Change Cipher Messages

1. Who sends the Change Cipher Spec message, the client, the server, or both?



Both server and client send the Change Cipher Spec message.

2. What are the contents carried inside the Change Cipher Spec message? Look past the Content Type and other headers to see the message itself.



Content Type: Change Cipher Spec (20)
