Project 1

Problem Statement :-

This is a very simple project with no deliverables. This project is to get familiar with the WLAN protocol and observe the management and data frames exchanges between stations and Aps in an 802.11 WLAN.

Abhishek Verma

1.To perform this exercise, you need to first download the Project1.PCAP file available on this page.

-> Downloaded

2. After the file is downloaded, you will need packet analysis software to open the file. If you do not already have a packet analyzer installed on your computer, you can download Wireshark from www.wireshark.org.

-> Wireshark is already installed

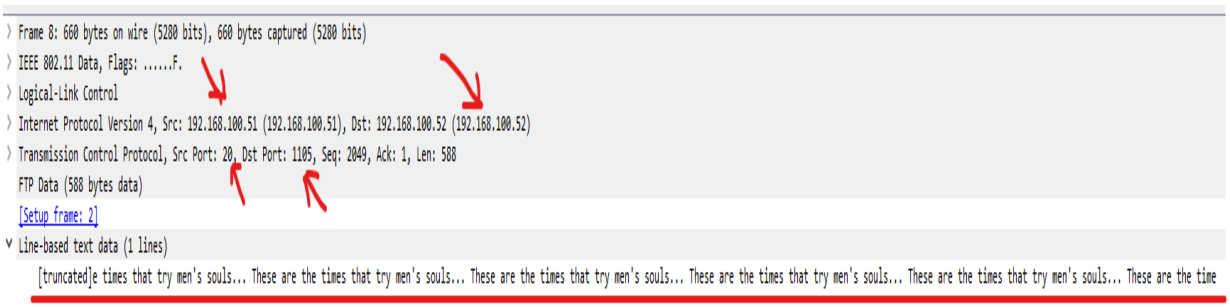
3. Using the packet analyzer, open the downloaded PCAP file. Most packet analyzers display a list of capture frames in the upper section of the screen, with each frame numbered sequentially in the first column.

->That is exactly the case in the capture.

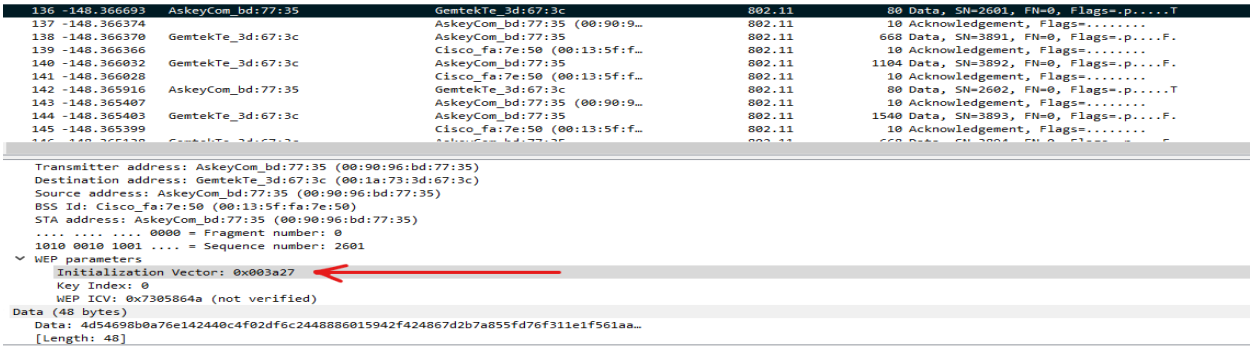
4. Scroll down the list of frames and click frame #8, which is an unencrypted simple data frame. Look at the frame body and notice the upper-layer information, such as IP addresses and TCP ports. Make sure that the IP address you see is 192.168.100.51 and source IP and 192.168.100.52 as destination IP. The source TCP port is 20 and destination port is 1105. Note that this is an unencrypted data frame and even at the upper layer, the protocol is plain ftp with not application layer encryption.

-> Able to validate all the details on the pcap.

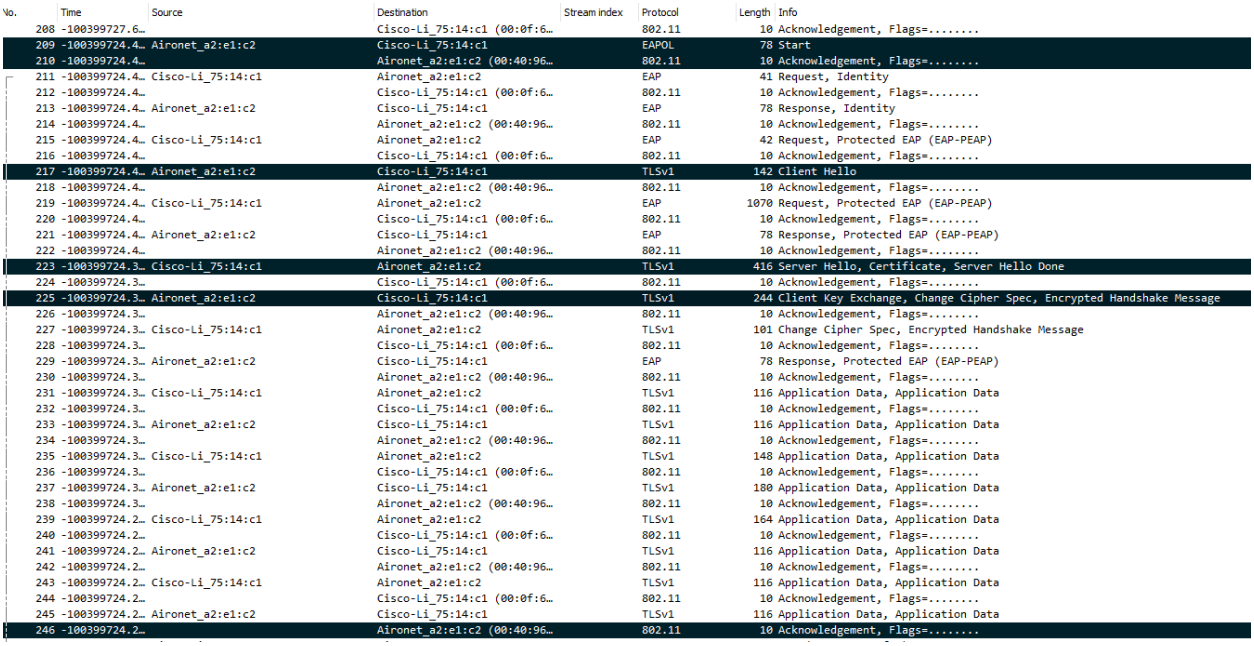
No.	Time	Source	Destination	Stream index	Protocol	Length	Info
1	0.000000	Cisco_fa:7e:50	Broadcast		802.11	150	Beacon frame, SN=2741, FN=0, Flags=........, BI=100, SSID=airspy
2	0.000005	192.168.100.51	192.168.100.52	0	FTP-DATA	660	FTP Data: 588 bytes
3	0.000009		Cisco_fa:7e:50 (00:13:5f:f…		802.11	10	Acknowledgement, Flags=........
4	0.000012	192.168.100.52	192.168.100.51	0	TCP	72	1105 → 20 [ACK] Seq=1 Ack=589 Win=17520 Len=0
5	0.000016		AskeyCom_bd:77:35 (00:90:9…		802.11	10	Acknowledgement, Flags=........
6	0.000071	192.168.100.51	192.168.100.52	0	FTP-DATA	1532	FTP Data: 1460 bytes
7	0.000076		Cisco_fa:7e:50 (00:13:5f:f…		802.11	10	Acknowledgement, Flags=........
8	0.000290	192.168.100.51	192.168.100.52	0	FTP-DATA	660	FTP Data: 588 bytes



5. Click frame #136, which is an encrypted simple data frame. Look at the frame body and notice that WEP encryption is being used and that the upper-layer information cannot be seen. Make sure to note the WEP parameters – Initialization vector (IV) is 0x003a27 and the Integrity Code (ICV) is 0x7305864a. Note the position of these in the frame data.



6. Scroll down the list of frames and observe the EAP frame exchange from frame #209 to frame #246. Make sure to note that this sequence starts with an 802.1X authentication frame followed by acknowledgement. Note that the source MAC address in #209 is the receiver MAC address is #210. Note that the number of frame exchanges for the entire authentication process. Note that the Administrator is being authenticated. Note after being authenticated, EAP-PEAP over TLS is being requested. You can also see the content of the digital certificate and extract the information on the signing authority.



```
> Logical-Link Control
> 802.1X Authentication
v Extensible Authentication Protocol
    Code: Request (1)
    Id: 3
    Length: 380
    Type: Protected EAP (EAP-PEAP) (25)
  > EAP-TLS Flags: 0x00
  > [2 EAP-TLS Fragments (1398 bytes): #219(1024), #223(374)]
  v Transport Layer Security
    > TLSv1 Record Layer: Handshake Protocol: Server Hello
    v TLSv1 Record Layer: Handshake Protocol: Certificate
        Content Type: Handshake (22)
        Version: TLS 1.0 (0x0301)
        Length: 1305
      v Handshake Protocol: Certificate
          Handshake Type: Certificate (11)
          Length: 1301
          Certificates Length: 1298
        > Certificates (1298 bytes)
    > TLSv1 Record Layer: Handshake Protocol: Server Hello Done
```

7. Scroll down the list of frames and observe the 4-Way Handshake from frame #247 to frame #254. Make sure to note all the 4 messages in the 4-way handshake and key exchange. Note that CCMP encryption is being used.

```
247 -100399724.2… Cisco-Li_75:14:c1   Aironet_a2:e1:c2          EAPOL    131 Key (Message 1 of 4)
248 -100399724.2…                     Cisco-Li_75:14:c1 (00:0f:6… 802.11  10 Acknowledgement, Flags=........
249 -100399724.2… Aironet_a2:e1:c2    Cisco-Li_75:14:c1          EAPOL    155 Key (Message 2 of 4)
250 -100399724.2…                     Aironet_a2:e1:c2 (00:40:96… 802.11  10 Acknowledgement, Flags=........
251 -100399724.2… Cisco-Li_75:14:c1   Aironet_a2:e1:c2          EAPOL    155 Key (Message 3 of 4)
252 -100399724.2…                     Cisco-Li_75:14:c1 (00:0f:6… 802.11  10 Acknowledgement, Flags=........
253 -100399724.2… Aironet_a2:e1:c2    Cisco-Li_75:14:c1          EAPOL    131 Key (Message 4 of 4)
254 -100399724.2…                     Aironet_a2:e1:c2 (00:40:96… 802.11  10 Acknowledgement, Flags=........
255 -100399724.2… Cisco-Li_75:14:c1   Aironet_a2:e1:c2          802.11   171 Data, SN=2541, FN=0, Flags=.p....F.
256 -100399724.2…                     Cisco-Li_75:14:c1 (00:0f:6… 802.11  10 Acknowledgement, Flags=........
```

```
> DSAP: SNAP (0xaa)
> SSAP: SNAP (0xaa)
> Control field: U, func=UI (0x03)
  Organization Code: 00:00:00 (Officially Xerox, but
  Type: 802.1X Authentication (0x888e)
v 802.1X Authentication
  Version: 802.1X-2001 (1)
  Type: Key (3)
  Length: 119
  Key Descriptor Type: EAPOL WPA Key (254)
  [Message number: 2]
> Key Information: 0x010a
  Key Length: 16
  Replay Counter: 0
  WPA Key Nonce: 3d80b4ecd7b218c61f58912108d49fb625069860b7ec03b08086f123b0715ddb
  Key IV: 00000000000000000000000000000000
  WPA Key RSC: 0000000000000000
  WPA Key ID: 0000000000000000
  WPA Key MIC: cd5eaf88971a3b3592f8f3222203482d
  WPA Key Data Length: 24
> WPA Key Data: dd160050f20101000050f20401000050f20401000050f201
```