Assignment 3

Asterisk and VoIP

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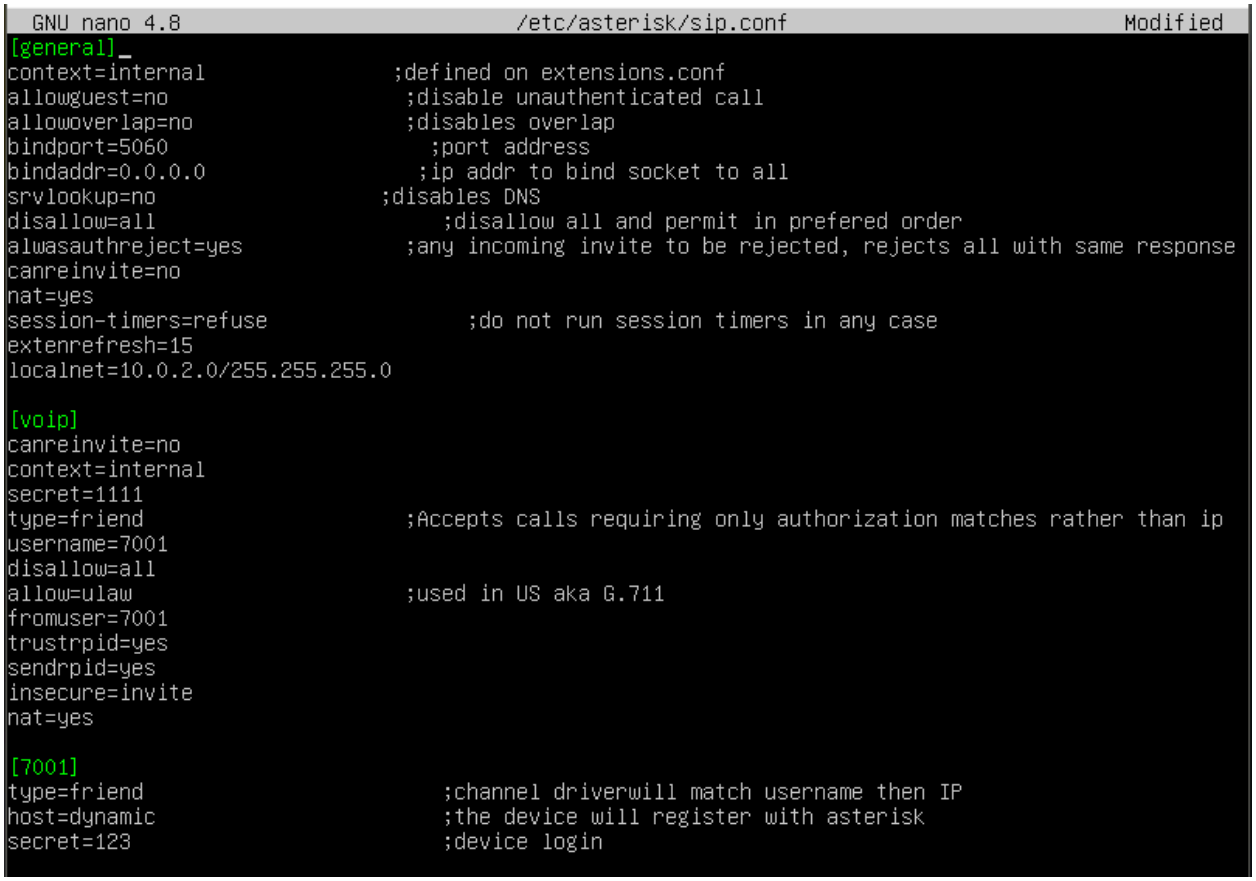
Executive Summary:

In this Assignment, we discover Asterisk and VoIP and how they are used. We discover what the asterisk modules are, the Asterisk Gateway interface, and the Asterisk Extensions Language and how each one of the are used in Asterisk and its dial plan.

1.

Dial Plan:

SIP.conf:



Extensions.conf:

```
  GNU nano 4.8                    /etc/asterisk/extensions.conf                    Modified
[internal]
exten => 7001,1,Answer()                        ;Answer first
exten => 7001,2,Dial(SIP/7001,60)               ;user / port number
exten => 7001,3,Playback(vm-nobodyavail)        ;if no answer
exten => 7001,4,VoiceMail(7001@main)            ;go to voicemail
exten => 7001,5,Hangup()                        ;hangup

exten => 7002,1,Answer()
exten => 7002,2,Dial(SIP/7002,60)
exten => 7002,3,Playback(vm-nobodyavail)
exten => 7002,4,VoiceMail(7002@main)
exten => 7002,5,Hangup()

exten => 8001,1,VoicemailMain(7001@main)          ;voicemail mailbox for user 7001
exten => 8001,2,Hangup()

exten => 8002,1,VoicemailMain(7002@main)          ;voicemail mailbox for user 7002
exten => 8002,2,Hangup()
```

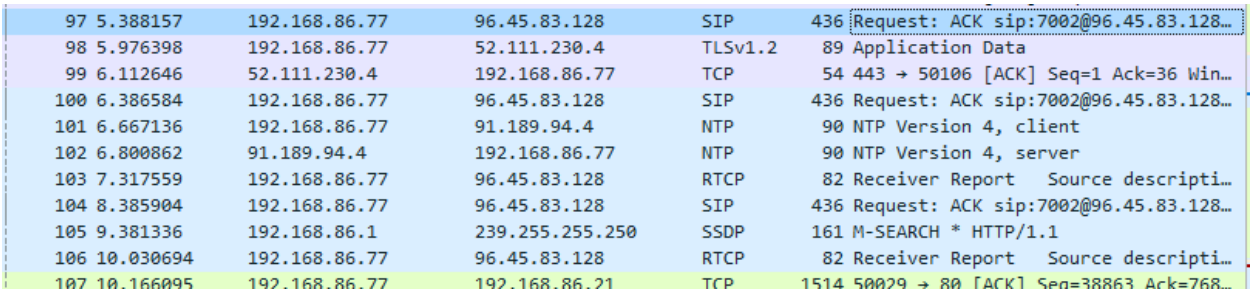
Voicemail.conf:

```
  GNU nano 4.8                     /etc/asterisk/voicemail.conf
[main]
7001 => 123
7002 => 456
```

2.

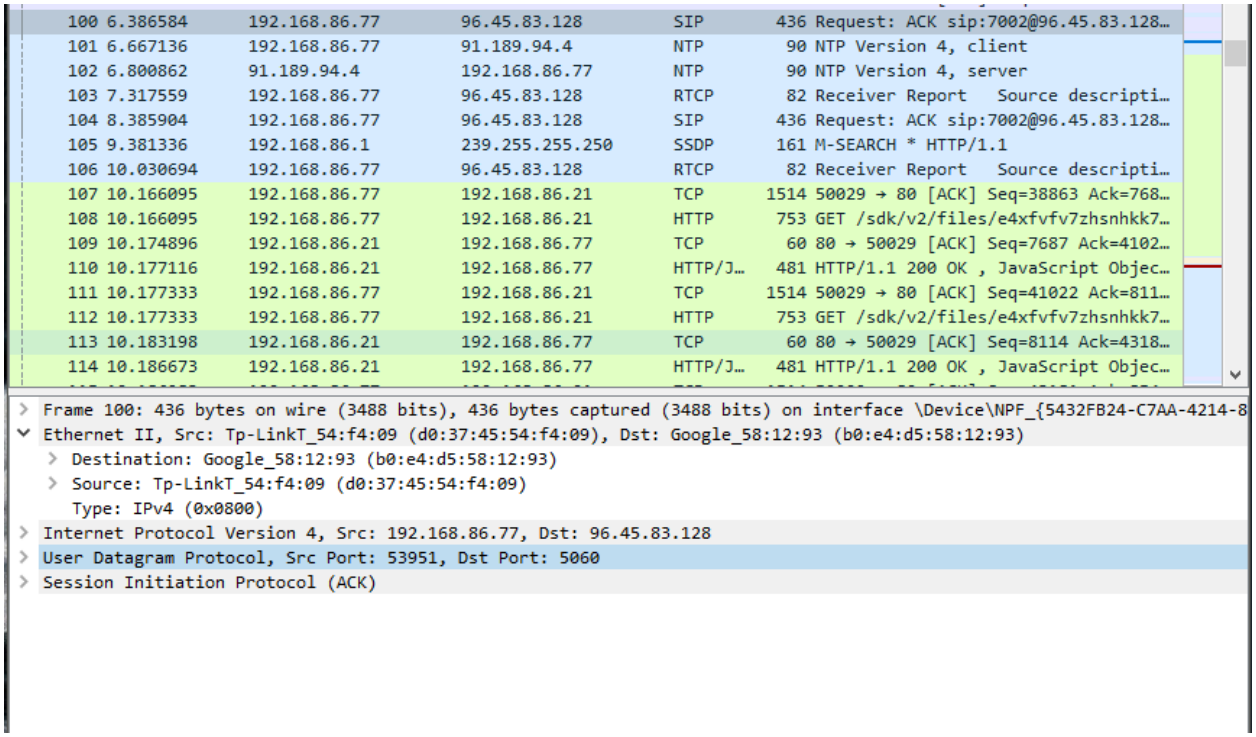
Wireshark Packets:

Sip caller to server to collie:



97	5.388157	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
98	5.976398	192.168.86.77	52.111.230.4	TLSv1.2	89 Application Data
99	6.112646	52.111.230.4	192.168.86.77	TCP	54 443 → 50106 [ACK] Seq=1 Ack=36 Win…
100	6.386584	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
101	6.667136	192.168.86.77	91.189.94.4	NTP	90 NTP Version 4, client
102	6.800862	91.189.94.4	192.168.86.77	NTP	90 NTP Version 4, server
103	7.317559	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
104	8.385904	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161 M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=38863 Ack=768…

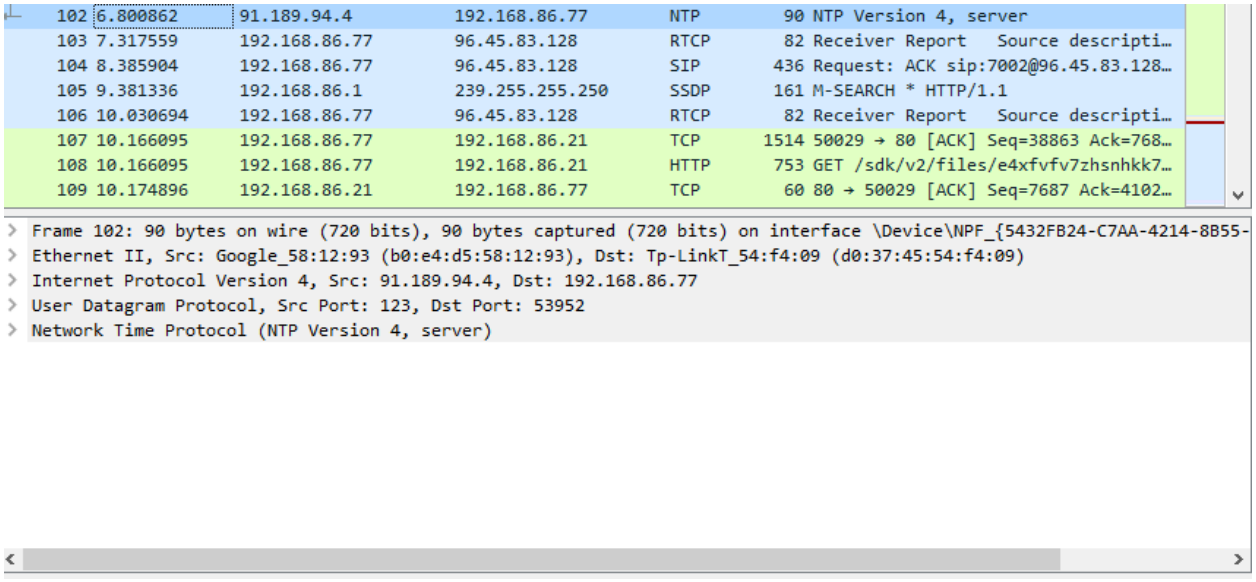
Request Ack from user 7001 to 7002:



100	6.386584	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
101	6.667136	192.168.86.77	91.189.94.4	NTP	90 NTP Version 4, client
102	6.800862	91.189.94.4	192.168.86.77	NTP	90 NTP Version 4, server
103	7.317559	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
104	8.385904	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161 M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=38863 Ack=768…
108	10.166095	192.168.86.77	192.168.86.21	HTTP	753 GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
109	10.174896	192.168.86.21	192.168.86.77	TCP	60 80 → 50029 [ACK] Seq=7687 Ack=4102…
110	10.177116	192.168.86.21	192.168.86.77	HTTP/J…	481 HTTP/1.1 200 OK , JavaScript Objec…
111	10.177333	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=41022 Ack=811…
112	10.177333	192.168.86.77	192.168.86.21	HTTP	753 GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
113	10.183198	192.168.86.21	192.168.86.77	TCP	60 80 → 50029 [ACK] Seq=8114 Ack=4318…
114	10.186673	192.168.86.21	192.168.86.77	HTTP/J…	481 HTTP/1.1 200 OK , JavaScript Objec…

```
> Frame 100: 436 bytes on wire (3488 bits), 436 bytes captured (3488 bits) on interface \Device\NPF_{5432FB24-C7AA-4214-8
v Ethernet II, Src: Tp-LinkT_54:f4:09 (d0:37:45:54:f4:09), Dst: Google_58:12:93 (b0:e4:d5:58:12:93)
    > Destination: Google_58:12:93 (b0:e4:d5:58:12:93)
    > Source: Tp-LinkT_54:f4:09 (d0:37:45:54:f4:09)
      Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.86.77, Dst: 96.45.83.128
> User Datagram Protocol, Src Port: 53951, Dst Port: 5060
> Session Initiation Protocol (ACK)
```

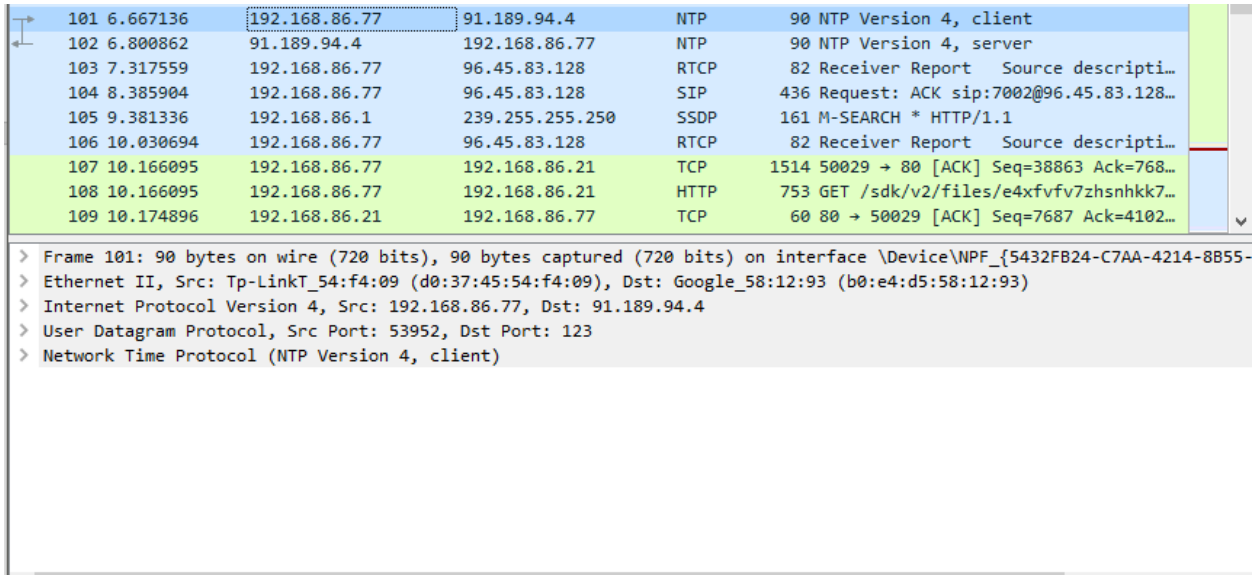
From Server:



102	6.800862	91.189.94.4	192.168.86.77	NTP	90	NTP Version 4, server
103	7.317559	192.168.86.77	96.45.83.128	RTCP	82	Receiver Report Source descripti…
104	8.385904	192.168.86.77	96.45.83.128	SIP	436	Request: ACK sip:7002@96.45.83.128…
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161	M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82	Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514	50029 → 80 [ACK] Seq=38863 Ack=768…
108	10.166095	192.168.86.77	192.168.86.21	HTTP	753	GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
109	10.174896	192.168.86.21	192.168.86.77	TCP	60	80 → 50029 [ACK] Seq=7687 Ack=4102…

```
> Frame 102: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NPF_{5432FB24-C7AA-4214-8B55-
> Ethernet II, Src: Google_58:12:93 (b0:e4:d5:58:12:93), Dst: Tp-LinkT_54:f4:09 (d0:37:45:54:f4:09)
> Internet Protocol Version 4, Src: 91.189.94.4, Dst: 192.168.86.77
> User Datagram Protocol, Src Port: 123, Dst Port: 53952
> Network Time Protocol (NTP Version 4, server)
```

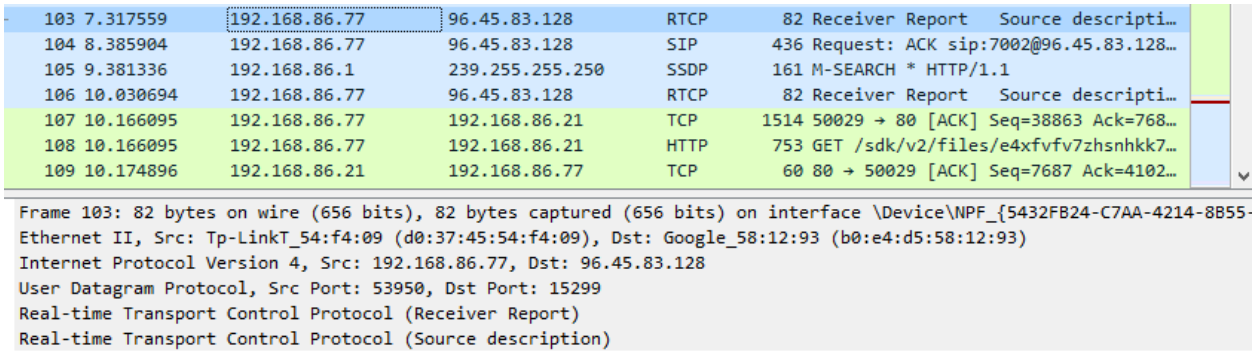
From Client:



101	6.667136	192.168.86.77	91.189.94.4	NTP	90	NTP Version 4, client
102	6.800862	91.189.94.4	192.168.86.77	NTP	90	NTP Version 4, server
103	7.317559	192.168.86.77	96.45.83.128	RTCP	82	Receiver Report Source descripti…
104	8.385904	192.168.86.77	96.45.83.128	SIP	436	Request: ACK sip:7002@96.45.83.128…
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161	M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82	Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514	50029 → 80 [ACK] Seq=38863 Ack=768…
108	10.166095	192.168.86.77	192.168.86.21	HTTP	753	GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
109	10.174896	192.168.86.21	192.168.86.77	TCP	60	80 → 50029 [ACK] Seq=7687 Ack=4102…

```
> Frame 101: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NPF_{5432FB24-C7AA-4214-8B55-
> Ethernet II, Src: Tp-LinkT_54:f4:09 (d0:37:45:54:f4:09), Dst: Google_58:12:93 (b0:e4:d5:58:12:93)
> Internet Protocol Version 4, Src: 192.168.86.77, Dst: 91.189.94.4
> User Datagram Protocol, Src Port: 53952, Dst Port: 123
> Network Time Protocol (NTP Version 4, client)
```

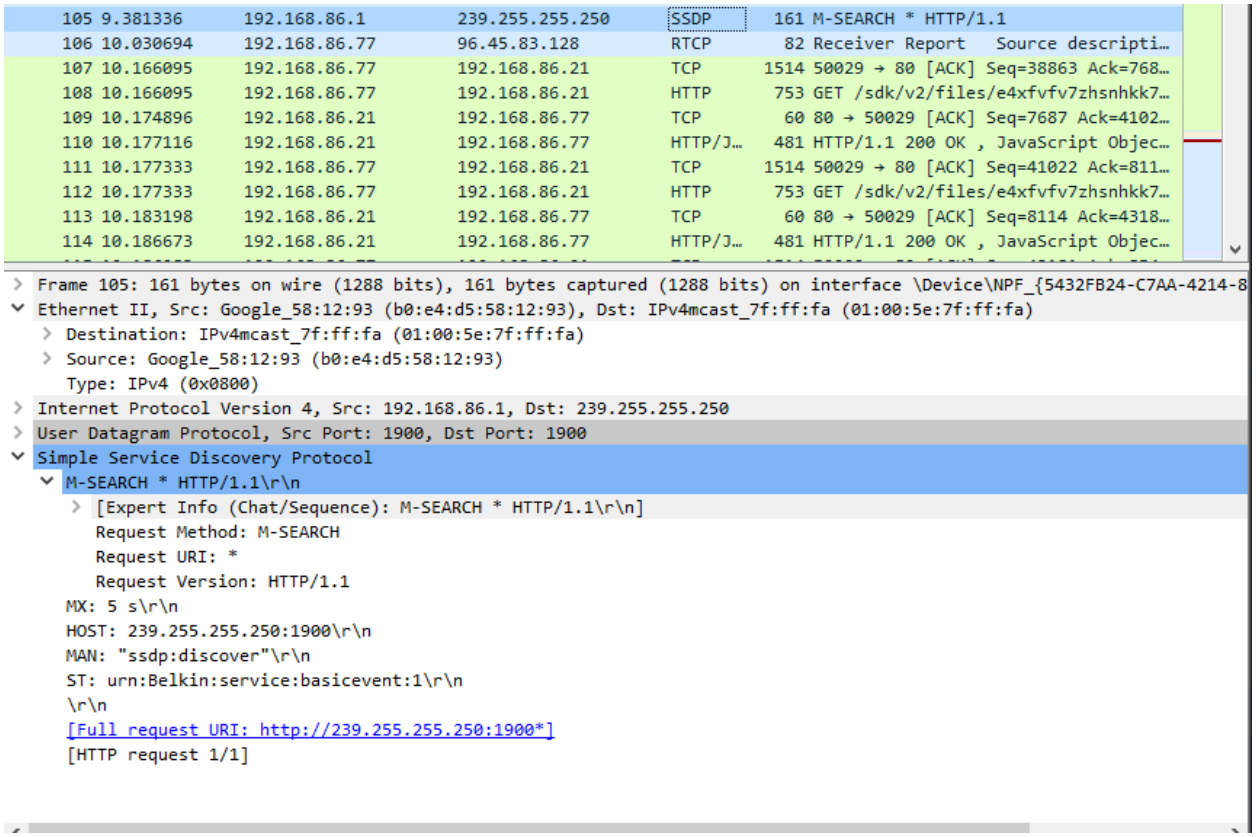
Receiver Report:



103	7.317559	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
104	8.385904	192.168.86.77	96.45.83.128	SIP	436 Request: ACK sip:7002@96.45.83.128…
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161 M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=38863 Ack=768…
108	10.166095	192.168.86.77	192.168.86.21	HTTP	753 GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
109	10.174896	192.168.86.21	192.168.86.77	TCP	60 80 → 50029 [ACK] Seq=7687 Ack=4102…

```
Frame 103: 82 bytes on wire (656 bits), 82 bytes captured (656 bits) on interface \Device\NPF_{5432FB24-C7AA-4214-8B55-
Ethernet II, Src: Tp-LinkT_54:f4:09 (d0:37:45:54:f4:09), Dst: Google_58:12:93 (b0:e4:d5:58:12:93)
Internet Protocol Version 4, Src: 192.168.86.77, Dst: 96.45.83.128
User Datagram Protocol, Src Port: 53950, Dst Port: 15299
Real-time Transport Control Protocol (Receiver Report)
Real-time Transport Control Protocol (Source description)
```

SDP Payload:



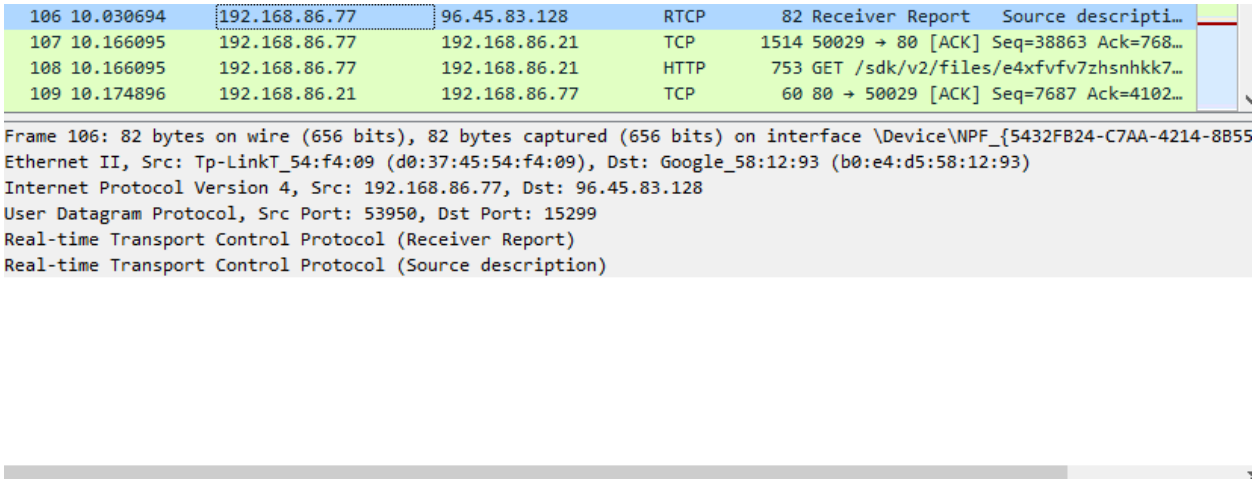
105	9.381336	192.168.86.1	239.255.255.250	SSDP	161 M-SEARCH * HTTP/1.1
106	10.030694	192.168.86.77	96.45.83.128	RTCP	82 Receiver Report Source descripti…
107	10.166095	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=38863 Ack=768…
108	10.166095	192.168.86.77	192.168.86.21	HTTP	753 GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
109	10.174896	192.168.86.21	192.168.86.77	TCP	60 80 → 50029 [ACK] Seq=7687 Ack=4102…
110	10.177116	192.168.86.21	192.168.86.77	HTTP/J…	481 HTTP/1.1 200 OK , JavaScript Objec…
111	10.177333	192.168.86.77	192.168.86.21	TCP	1514 50029 → 80 [ACK] Seq=41022 Ack=811…
112	10.177333	192.168.86.77	192.168.86.21	HTTP	753 GET /sdk/v2/files/e4xfvfv7zhsnhkk7…
113	10.183198	192.168.86.21	192.168.86.77	TCP	60 80 → 50029 [ACK] Seq=8114 Ack=4318…
114	10.186673	192.168.86.21	192.168.86.77	HTTP/J…	481 HTTP/1.1 200 OK , JavaScript Objec…

```
> Frame 105: 161 bytes on wire (1288 bits), 161 bytes captured (1288 bits) on interface \Device\NPF_{5432FB24-C7AA-4214-8
v Ethernet II, Src: Google_58:12:93 (b0:e4:d5:58:12:93), Dst: IPv4mcast_7f:ff:fa (01:00:5e:7f:ff:fa)
  > Destination: IPv4mcast_7f:ff:fa (01:00:5e:7f:ff:fa)
  > Source: Google_58:12:93 (b0:e4:d5:58:12:93)
    Type: IPv4 (0x0800)
> Internet Protocol Version 4, Src: 192.168.86.1, Dst: 239.255.255.250
> User Datagram Protocol, Src Port: 1900, Dst Port: 1900
v Simple Service Discovery Protocol
  v M-SEARCH * HTTP/1.1\r\n
    > [Expert Info (Chat/Sequence): M-SEARCH * HTTP/1.1\r\n]
      Request Method: M-SEARCH
      Request URI: *
      Request Version: HTTP/1.1
    MX: 5 s\r\n
    HOST: 239.255.255.250:1900\r\n
    MAN: "ssdp:discover"\r\n
    ST: urn:Belkin:service:basicevent:1\r\n
    \r\n
    [Full request URI: http://239.255.255.250:1900*]
    [HTTP request 1/1]
```

- Uses UDP port 1900

- Uses HTTP

RTCP header:



The RTCP header

5 Key characteristics of RTP:

- Has the ability to reconstruct timing.
- Loss detection
- Security
- Content delivery
- Identification of encoding schemes

3.

4.

5.

For G.711:

6.

7.

8.

Asterisk Modules:

Asterisk uses modules, those modules are basically loadable components within the program that provides a specific functionality, as well as a resource that allows connection to an external technology.

Asterisk Extensions Language (AEL):

AEL is a specialized language intended only for Asterisk dial plans, it is a merger of 4 different 'languages'/'syntaxes', such as: the AEL syntax itself, Expression syntax, variable reference syntax, and extension language syntax.

Asterisk Gateway Interface (AGI):

AGI is a software interface for asterisk that allows external, user written programs to be launched from the asterisk dial plan.