

# CISCO PROJECT 9

## Session Initiation Protocol

Akash Ranjan Das  
Rakshita Bantwal  
Hrithik Rajput

1SI18CS008  
1SI18CS085  
1SI18CS042

# Session Initiation Protocol (SIP)

- Session Initiation Protocol (SIP) is one of the most common protocols used in **VoIP** technology.

**Voice over Internet Protocol**

**Voice & Multimedia**

# **What is VoIP Technology ?**

**Video Conferencing**

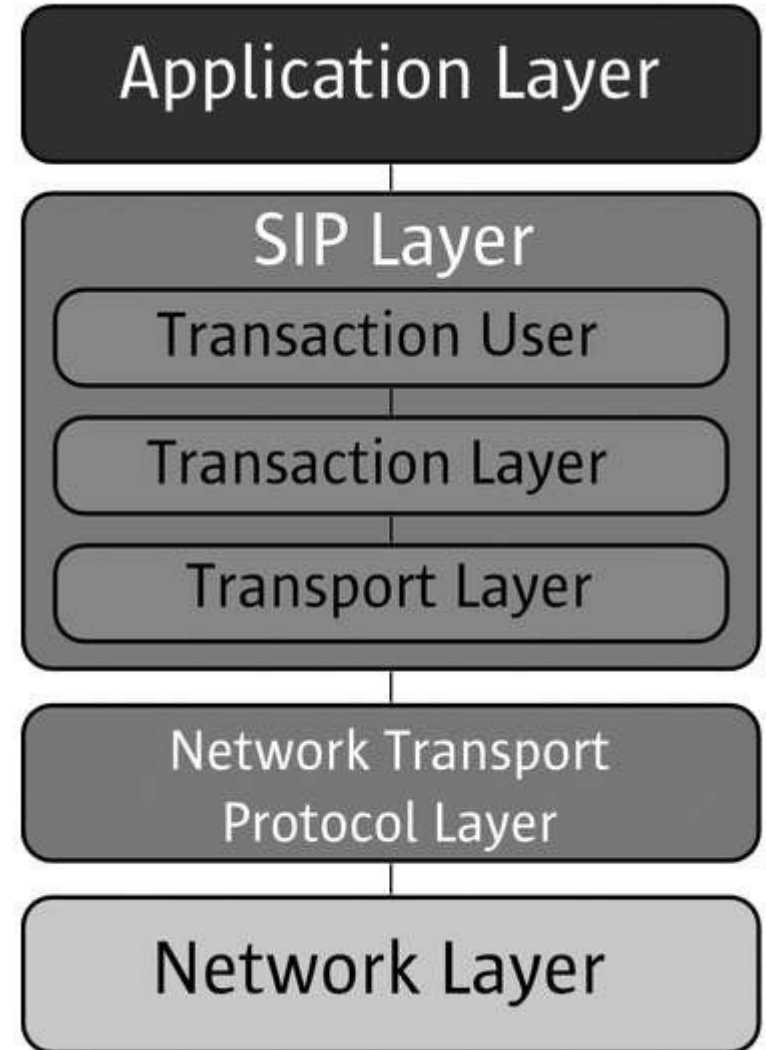
**Cheap & Portable**

# Session Initiation Protocol (SIP)

- Session Initiation Protocol (SIP) is one of the most common protocols used in **VoIP** technology.
- It is an application layer protocol that works in conjunction with other application layer protocols to control multimedia communication sessions over the Internet.
- SIP is a signalling protocol used to create, modify, and terminate a multimedia session over the Internet Protocol.
- A session is nothing but a simple call between two endpoints.
- An endpoint can be a smartphone, a laptop, or any device that can receive and send multimedia content over the Internet.

# Where Does SIP Fit?

- Basically SIP is an **application layer** protocol. It is a simple network signalling protocol for creating and terminating sessions with one or more participants.
- The SIP protocol is designed to be independent of the underlying transport protocol, so SIP applications can run on TCP, UDP, or other lower-layer networking protocols.



# Network Elements

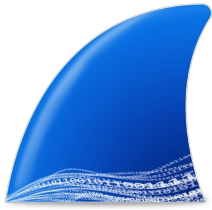
**USER AGENT**

**PROXY SERVER**

**REGISTRAR SERVER**

**REDIRECT SERVER**

**LOCATION SERVER**



# WireShark Capture

slp\_sample1.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.10.41	192.168.10.2	SIP	596	Request: REGISTER sip:192.168.10.2 (1 binding)
2	0.000692	192.168.10.2	192.168.10.41	SIP	610	Status: 401 Unauthorized
3	0.005771	192.168.10.41	192.168.10.2	SIP	755	Request: REGISTER sip:192.168.10.2 (1 binding)
4	0.009246	192.168.10.2	192.168.10.41	SIP	625	Request: OPTIONS sip:10000@192.168.10.41:13434;rinstance=309c...
5	0.010308	192.168.10.2	192.168.10.41	SIP	654	Status: 200 OK (1 binding)
6	0.017462	192.168.10.41	192.168.10.2	SIP	593	Status: 200 OK
7	0.024945	192.168.10.41	192.168.10.2	SIP	600	Request: SUBSCRIBE sip:10000@192.168.10.2
8	0.028999	192.168.10.2	192.168.10.41	SIP	611	Status: 401 Unauthorized
9	0.032569	192.168.10.41	192.168.10.2	SIP	664	Request: SUBSCRIBE sip:10000@192.168.10.2
10	0.033144	192.168.10.2	192.168.10.41	SIP	599	Status: 401 Unauthorized
11	0.043205	192.168.10.41	192.168.10.2	SIP	765	Request: SUBSCRIBE sip:10000@192.168.10.2
12	0.043782	192.168.10.2	192.168.10.41	SIP	528	Status: 404 Not Found
13	0.047481	192.168.10.41	192.168.10.2	SIP	829	Request: SUBSCRIBE sip:10000@192.168.10.2
14	0.047988	192.168.10.2	192.168.10.41	SIP	516	Status: 404 Not Found
15	8.777569	192.168.10.41	192.168.10.2	SIP/SDP	1020	Request: INVITE sip:10000@192.168.10.2
16	8.778390	192.168.10.2	192.168.10.41	SIP	608	Status: 401 Unauthorized
17	8.779575	192.168.10.41	192.168.10.2	SIP	394	Request: ACK sip:10000@192.168.10.2
18	8.783844	192.168.10.41	192.168.10.2	SIP/SDP	1185	Request: INVITE sip:10000@192.168.10.2
19	8.784732	192.168.10.2	192.168.10.41	SIP	542	Status: 100 Trying
20	8.807730	192.168.10.2	192.168.10.41	SIP	558	Status: 180 Ringing
21	16.404854	192.168.10.40	192.168.10.41	RTCP	174	Receiver Report Source description
22	16.421988	192.168.10.40	192.168.10.41	RTP	214	PT=ITU-T G.711 PCMU, SSRC=0xB72A7104, Seq=3886, Time=1658400,...
23	16.428090	192.168.10.2	192.168.10.41	SIP/SDP	873	Status: 200 OK
24	16.451500	192.168.10.40	192.168.10.41	RTP	214	PT=ITU-T G.711 PCMU, SSRC=0xB72A7104, Seq=3887, Time=1658560
25	16.465884	192.168.10.41	192.168.10.40	RTCP	174	Receiver Report Source description
26	16.469590	192.168.10.40	192.168.10.41	RTP	214	PT=ITU-T G.711 PCMU, SSRC=0xB72A7104, Seq=3888, Time=1658720
27	16.477819	192.168.10.41	192.168.10.2	SIP	647	Request: ACK sip:10000@192.168.10.2

Frame 1: 596 bytes on wire (4768 bits), 596 bytes captured (4768 bits)  
Ethernet II, Src: Dell\_27:c1:7d (00:23:ae:27:c1:7d), Dst: Asiarock\_b6:d6:92 (00:19:66:b6:d6:92)  
Internet Protocol Version 4, Src: 192.168.10.41, Dst: 192.168.10.2  
User Datagram Protocol, Src Port: 13434, Dst Port: 5060  
Session Initiation Protocol (REGISTER)

0000 00 19 66 b6 d6 92 00 23 ae 27 c1 7d 08 00 45 00 ..f...#.'}.E-  
0010 02 46 56 21 00 00 11 4d 0a c0 a8 0a 29 c0 a8 .FV!....M....).  
0020 0a 02 34 7a 13 c4 02 32 2c 06 52 45 47 49 53 54 .4z...2,REGIST  
0030 45 52 26 73 69 70 3a 31 39 32 2e 31 36 38 2e 31 ER sip:1 92.168.1  
0040 30 2e 32 20 53 49 50 2f 32 2e 30 0d 0a 56 69 61 0.2 SIP/2.0 Via  
0050 3a 20 53 49 50 2f 32 2e 30 2f 55 4a 50 20 31 39 : SIP/2.0/UDP 19  
0060 32 2e 31 36 38 2e 31 30 2e 34 31 3a 31 33 34 33 2.168.10 .41:1343  
0070 34 3b 62 72 61 6e 63 68 3d 7a 39 68 47 34 62 4b 4;branch =z9Hg4bK  
0080 2d 64 38 37 35 34 7a 2d 62 65 32 30 32 61 30 61 -d8754z- be202a0a  
0090 36 63 65 33 37 31 34 66 2d 31 2d 2d 2d 64 38 37 6ce3714f -1---d87  
00a0 35 34 7a 2d 3b 72 70 6f 72 74 0d 0a 4d 61 78 2d 54z-;rpo rt-:Max-  
00b0 46 6f 72 77 61 72 64 73 3a 20 37 30 0d 0a 43 6f Forwards : 70 .Co  
00c0 6e 74 61 63 74 3a 20 3c 73 09 70 3a 31 30 30 30 ntact: < sip:1000  
00d0 39 40 31 39 32 2e 31 36 38 2e 31 30 2e 34 31 3a 9@192.16 8.10.41:  
00e0 31 33 34 33 34 3b 72 69 6e 73 74 61 6e 63 65 3d 13434;r instance=

slp\_sample1.pcap Packets: 1042 · Displayed: 1042 (100.0%) Profile: Default

# Python Analysis

```
In [18]: #List the SIP info fields wrt time for file 3
sip1[['No.', 'Time', 'Info']]
```

Out[18]:

	No.	Time	Info
	1	2	0.007889 Status: 100 Trying
	2	3	0.047524 Status: 180 Ringing
	151	152	4.056633 Request: REGISTER sip:Verso.com (1 binding)
	152	153	4.072335 Status: 200 OK (1 binding)
	516	517	8.524137 Request: ACK sip:francisco@200.57.7.204:5061
	1723	1724	17.457029 Request: REGISTER sip:bestel.com (1 binding)
	1726	1727	17.473413 Status: 200 OK (1 binding)
	2910	2911	24.309202 Request: REGISTER sip:Verso.com (1 binding)
	2911	2912	24.324792 Status: 200 OK (1 binding)
	2964	2965	24.674680 Status: 100 Trying
	2966	2967	24.692752 Status: 180 Ringing

```
In [109]: #Analysis 1 File 2
infos1 = sip1['Info'].to_list()
times1 = sip1['Time'].to_list()

print('Type Fields\n')
flags1 = []
print('Time\t\t\tType\t\t\tCommand\n')
for info1, time1 in zip(infos1, times1):
    flag1 = info1.split(':')
    command1 = flag1[1].split(' ')
    if(command1[1].isdigit()):
        command2 = flag1[1].strip().split(' ', 2)
        command1 = command2[1]
        print(time1, '\t\t\t', flag1[0], '\t\t\t', command1)
    else:
        command1 = flag1[1].strip().split(' ', 1)
        print(time1, '\t\t\t', flag1[0], '\t\t\t', command1[0])
    flags1.append(flag1[0])
```

Type Fields

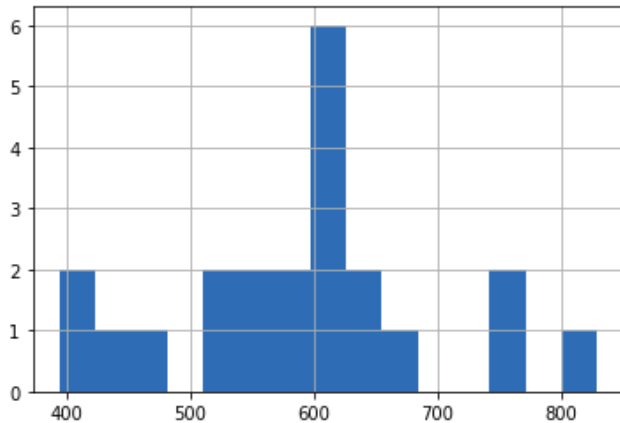
Time	Type	Command
0.007889	Status	Trying
0.047524	Status	Ringing
4.056633	Request	REGISTER
4.072335	Status	OK
8.524137	Request	ACK
17.457029	Request	REGISTER
17.473413	Status	OK
24.309202	Request	REGISTER
24.324792	Status	OK
24.67468	Status	Trying
24.692752	Status	Ringing



# Visualization using Matplotlib

```
In [23]: #Plot of Packets Length of SIP in File 1
%matplotlib inline
df[df['Protocol']=='SIP'].Length.hist(bins=15)
```

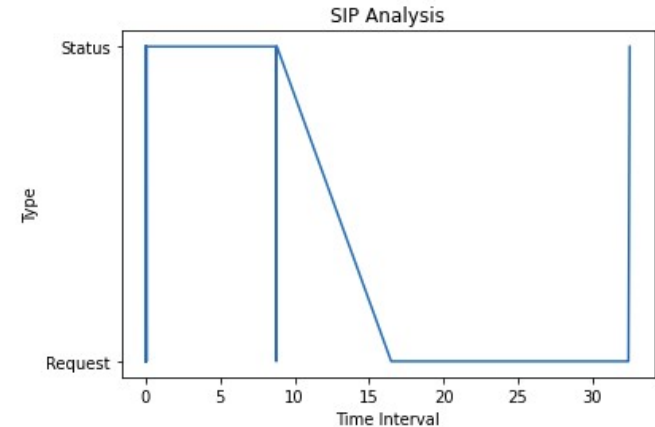
Out[23]: <AxesSubplot:>



Packets Length vs time

```
In [26]: import matplotlib.pyplot as plt
```

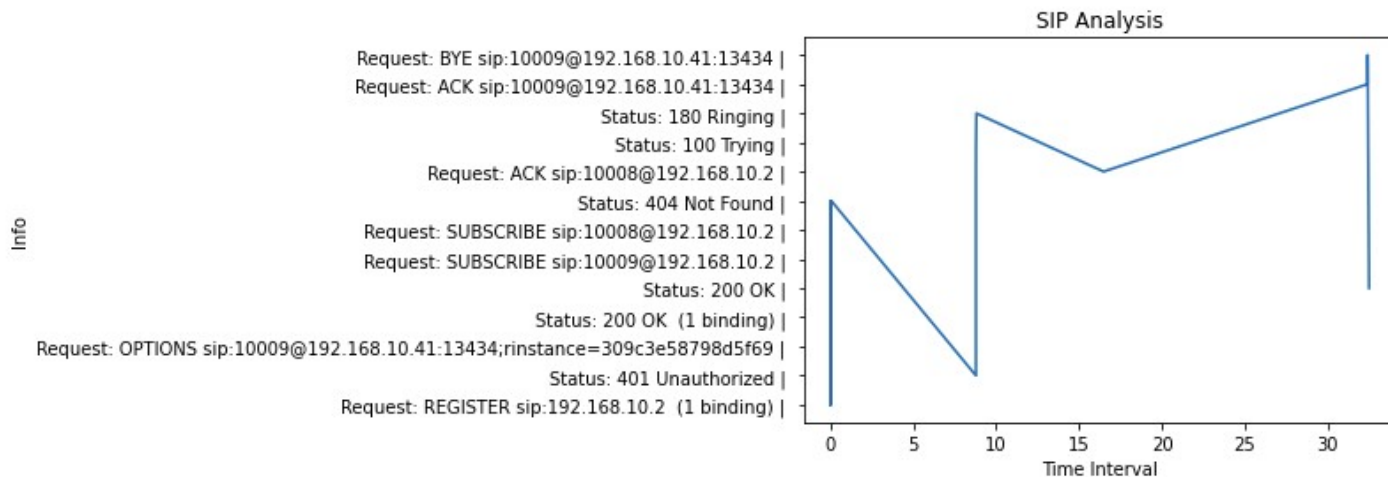
```
In [27]: #Plot Type vs time interval for File1
plt.plot(time, flags)
plt.xlabel('Time Interval')
plt.ylabel('Type')
plt.title('SIP Analysis')
plt.show()
```



Type vs Time interval

# Visualization using Matplotlib

```
In [28]: #Plot Information vs time interval for File1
plt.plot(times, infos)
plt.xlabel('Time Interval')
plt.ylabel('Info')
plt.title('SIP Analysis')
plt.show()
```

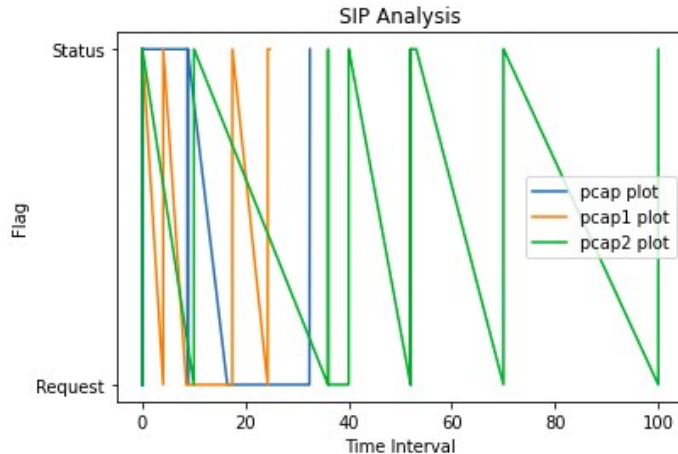


Info vs Time Interval

# Visualizing Three PCAP files

```
In [40]: #Visualizing all the analysis in one plot
plt.plot(times, flags, label='pcap plot')
plt.plot(times1, flags1, label='pcap1 plot')
plt.plot(times2, flags2, label='pcap2 plot')
plt.xlabel('Time Interval')
plt.ylabel('Flag')
plt.title('SIP Analysis')
plt.legend()
```

Out[40]: <matplotlib.legend.Legend at 0x7f7b69ec3908>





**THANK YOU**