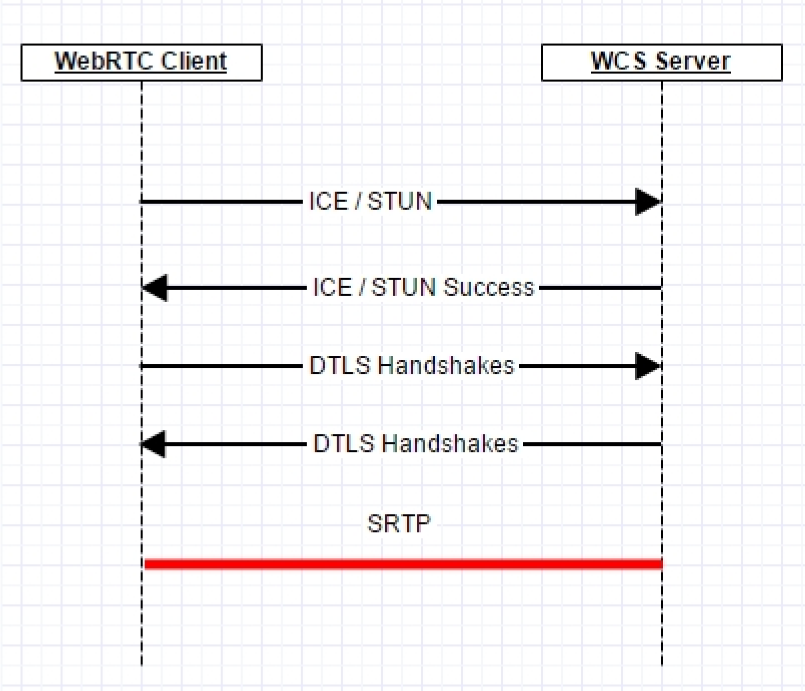
WebRTC

The technology

The WebRTC technology uses three main specifications in networking:
ICE and STUN
DTLS
SRTP

To establish a WebRTC connection, ICEis used. The web client sends STUN-requests to the WCS server, the WCS server responds to these requests and hence confirms it is ready to establish connection.

On the next stage, parties exchanges SSL certificates via DTLSand establish an encrypted channel between the web client and the WCS server. When the connection is established, SRTPtraffic is transmitted.



Possible problems

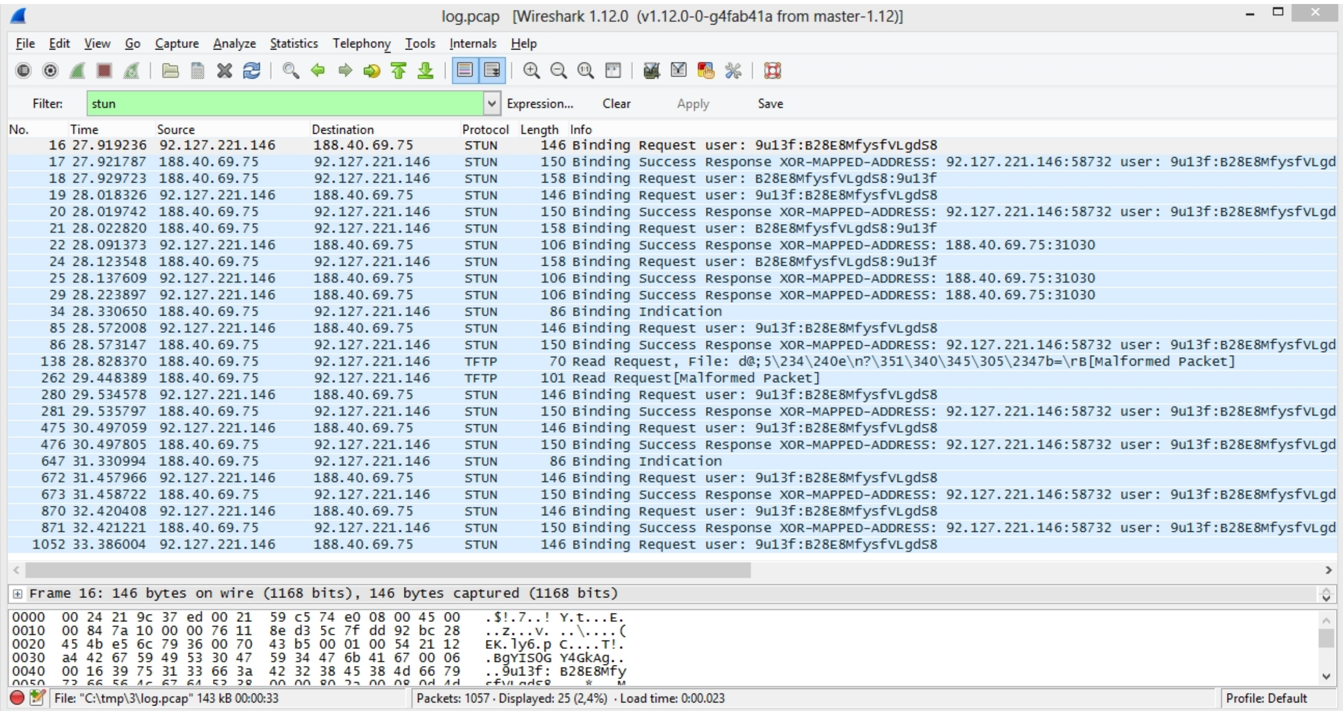
In most cases problems are related to UDP traffic of ICE, STUN, DTLS, SRTP not flowing between parts of the system.

Troubleshooting

Make sure all the traffic that takes part in establishing a WebRTC sessions and sending media data is unhindered and passes freely between call participants. Media ports of the WCS server in the range of [31000-32000] by default must be open to receive the incoming UDP traffic. If the WCS server is behind NAT and has an external IP address, make sure UDP packets sent to this external address are correctly routed to the corresponding ports of the WCS server behind NAT.

ICE and STUN traffic

Here is how ICE transactions exchange looks like before establishing connection. In the dunp these are usual STUN requests and answers. After the connection is established, ICE keeps working to monitor the established connection. If monitoring indicates ICE does not pass, the call is interrupted.


log.pcap [Wireshark 1.12.0 (v1.12.0-0-g4fab41a from master-1.12)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Expression...
Clear
Apply
Save

Filter: stun

```
No.   Time       Source          Destination     Protocol Length Info
   16 27.919236  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
   17 27.921787  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
   18 27.929723  188.40.69.75    92.127.221.146  STUN      158 Binding Request user: B28E8MfysfVLgdS8:9u13f
   19 28.018326  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
   20 28.019742  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
   21 28.022820  188.40.69.75    92.127.221.146  STUN      158 Binding Request user: B28E8MfysfVLgdS8:9u13f
   22 28.091373  92.127.221.146  188.40.69.75    STUN      106 Binding Success Response XOR-MAPPED-ADDRESS: 188.40.69.75:31030
   24 28.123548  188.40.69.75    92.127.221.146  STUN      158 Binding Request user: B28E8MfysfVLgdS8:9u13f
   25 28.137609  92.127.221.146  188.40.69.75    STUN      106 Binding Success Response XOR-MAPPED-ADDRESS: 188.40.69.75:31030
   29 28.223897  92.127.221.146  188.40.69.75    STUN      106 Binding Success Response XOR-MAPPED-ADDRESS: 188.40.69.75:31030
   34 28.330650  188.40.69.75    92.127.221.146  STUN       86 Binding Indication
   85 28.572008  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
   86 28.573147  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
  138 28.828370  188.40.69.75    92.127.221.146  TFTP       70 Read Request, File: d@;5\234\240e\n?\351\340\345\305\2347b=\rB[Malformed Packet]
  262 29.448389  188.40.69.75    92.127.221.146  TFTP      101 Read Request[Malformed Packet]
  280 29.534578  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
  281 29.535797  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
  475 30.497059  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
  476 30.497805  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
  647 31.330994  188.40.69.75    92.127.221.146  STUN       86 Binding Indication
  672 31.457966  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
  673 31.458722  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
  870 32.420408  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
  871 32.421221  188.40.69.75    92.127.221.146  STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221.146:58732 user: 9u13f:B28E8MfysfVLgd
 1052 33.386004  92.127.221.146  188.40.69.75    STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
```

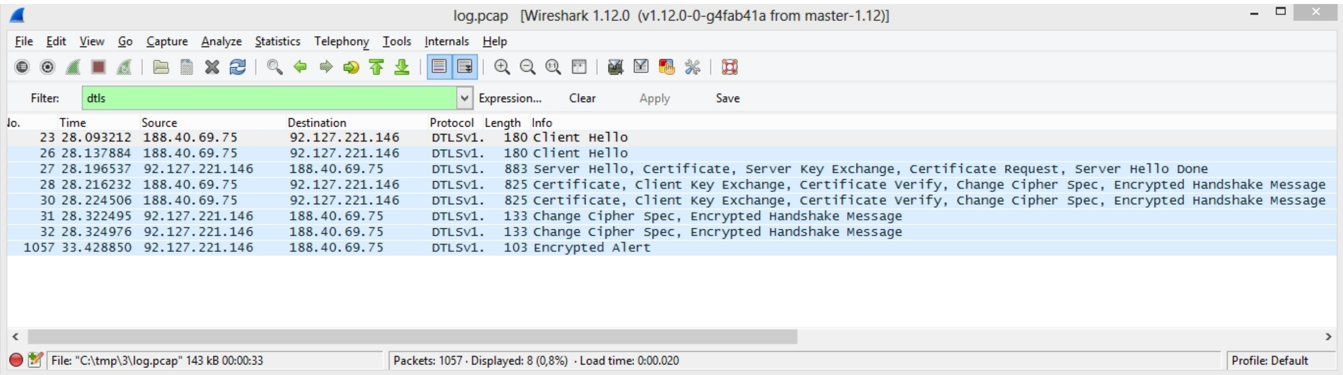
```
⊞ Frame 16: 146 bytes on wire (1168 bits), 146 bytes captured (1168 bits)
```

```
0000  00 24 21 9c 37 ed 00 21  59 c5 74 e0 08 00 45 00   .$!.7..! Y.t...E.
0010  00 84 7a 10 00 00 76 11  8e d3 5c 7f dd 92 bc 28   ..z...v. ..\....(
0020  45 4b e5 6c 79 36 00 70  43 b5 00 01 00 54 21 12   EK.ly6.p C....T!.
0030  a4 42 67 59 49 53 30 47  59 34 47 6b 41 67 00 06   .BgYIS0G Y4GkAg..
0040  00 16 39 75 31 33 66 3a  42 32 38 45 38 4d 66 79   ..9u13f: B28E8Mfy
```

File: "C:\tmp\3\log.pcap" 143 kB 00:00:33 | Packets: 1057 · Displayed: 25 (2,4%) · Load time: 0:00.023 | Profile: Default

DTLS traffic

DTLS starts working directly after ICE has established connection. Exchange of SSL certificates is several Handshake messages resulting in an established secure connection to transfer media data.


log.pcap [Wireshark 1.12.0 (v1.12.0-0-g4fab41a from master-1.12)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Expression...
Clear
Apply
Save

Filter: dtls

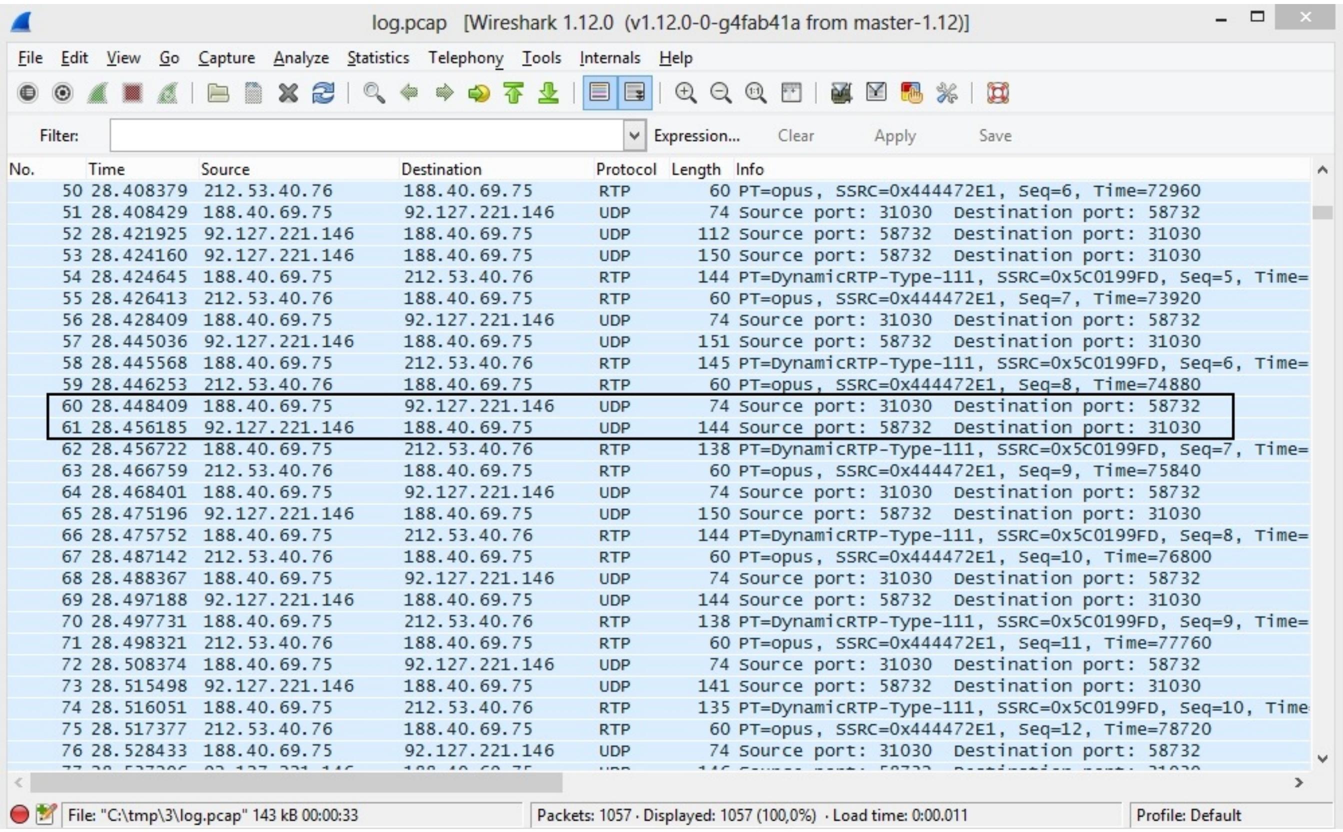
```
lo.   Time       Source          Destination     Protocol Length Info
   23 28.093212  188.40.69.75    92.127.221.146  DTLSv1.   180 Client Hello
   26 28.137884  188.40.69.75    92.127.221.146  DTLSv1.   180 Client Hello
   27 28.196537  92.127.221.146  188.40.69.75    DTLSv1.   883 Server Hello, Certificate, Server Key Exchange, Certificate Request, Server Hello Done
   28 28.216232  188.40.69.75    92.127.221.146  DTLSv1.   825 Certificate, Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted Handshake Message
   30 28.224506  188.40.69.75    92.127.221.146  DTLSv1.   825 Certificate, Client Key Exchange, Certificate Verify, Change Cipher Spec, Encrypted Handshake Message
   31 28.322495  92.127.221.146  188.40.69.75    DTLSv1.   133 Change Cipher Spec, Encrypted Handshake Message
   32 28.324976  92.127.221.146  188.40.69.75    DTLSv1.   133 Change Cipher Spec, Encrypted Handshake Message
 1057 33.428850  92.127.221.146  188.40.69.75    DTLSv1.   103 Encrypted Alert
```

File: "C:\tmp\3\log.pcap" 143 kB 00:00:33 | Packets: 1057 · Displayed: 8 (0,8%) · Load time: 0:00.020 | Profile: Default

SRTP traffic

Recognizing SRTP packets

When the data are sent via SRTP, Wireshark cannot recognize SRTP packets. Finding this packets is easy enough. By default, WCS uses the following port range to transmit media traffic [31000-32000], including WebRTC. In the dump we can see two unrecognized UDP packets, one of which is sent through the port 31030, and the second one is received to that port. For such packets, you should explicitly specify the protocol used.

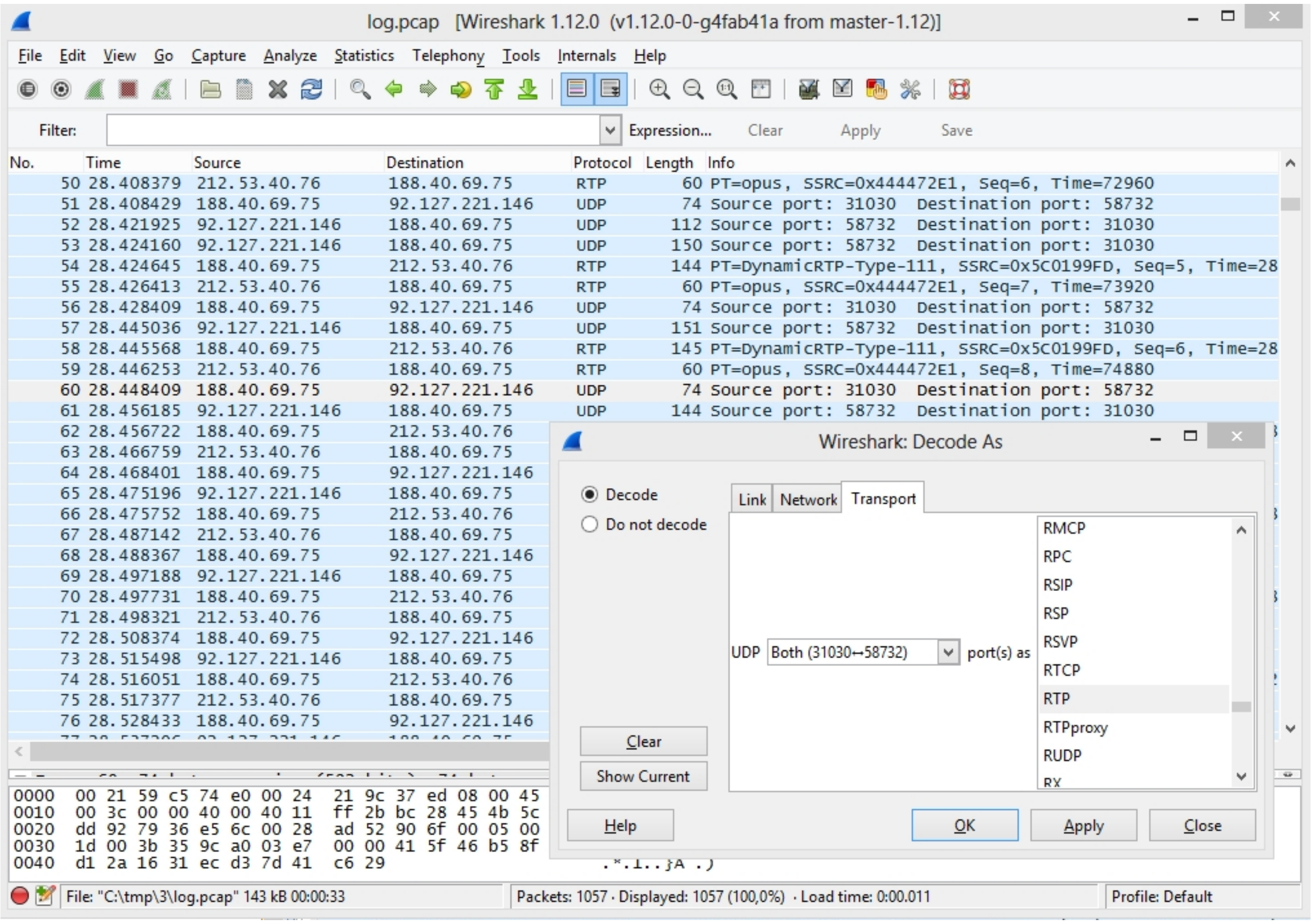


```
No.     Time        Source           Destination      Protocol Length Info
     50 28.408379   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=6, Time=72960
     51 28.408429   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     52 28.421925   92.127.221.146   188.40.69.75     UDP       112 Source port: 58732  Destination port: 31030
     53 28.424160   92.127.221.146   188.40.69.75     UDP       150 Source port: 58732  Destination port: 31030
     54 28.424645   188.40.69.75     212.53.40.76     RTP       144 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=5, Time=
     55 28.426413   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=7, Time=73920
     56 28.428409   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     57 28.445036   92.127.221.146   188.40.69.75     UDP       151 Source port: 58732  Destination port: 31030
     58 28.445568   188.40.69.75     212.53.40.76     RTP       145 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=6, Time=
     59 28.446253   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=8, Time=74880
     60 28.448409   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     61 28.456185   92.127.221.146   188.40.69.75     UDP       144 Source port: 58732  Destination port: 31030
     62 28.456722   188.40.69.75     212.53.40.76     RTP       138 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=7, Time=
     63 28.466759   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=9, Time=75840
     64 28.468401   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     65 28.475196   92.127.221.146   188.40.69.75     UDP       150 Source port: 58732  Destination port: 31030
     66 28.475752   188.40.69.75     212.53.40.76     RTP       144 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=8, Time=
     67 28.487142   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=10, Time=76800
     68 28.488367   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     69 28.497188   92.127.221.146   188.40.69.75     UDP       144 Source port: 58732  Destination port: 31030
     70 28.497731   188.40.69.75     212.53.40.76     RTP       138 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=9, Time=
     71 28.498321   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=11, Time=77760
     72 28.508374   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
     73 28.515498   92.127.221.146   188.40.69.75     UDP       141 Source port: 58732  Destination port: 31030
     74 28.516051   188.40.69.75     212.53.40.76     RTP       135 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=10, Time
     75 28.517377   212.53.40.76     188.40.69.75     RTP        60 PT=opus, SSRC=0x444472E1, Seq=12, Time=78720
     76 28.528433   188.40.69.75     92.127.221.146   UDP        74 Source port: 31030  Destination port: 58732
```

```
File: "C:\tmp\3\log.pcap" 143 kB 00:00:33 | Packets: 1057 · Displayed: 1057 (100,0%) · Load time: 0:00.011 | Profile: Default
```

Decoding SRTP packets

Wireshark can decode the UDP packets it found if we explicitly specify the protocol. In the packet properties select 'Decode As..', then select the RTP protocol for all packets that run between the browser (port 31030) and the WCS server (port 58732). These ports are reserved dynamically, so in your case the values might be different.


log.pcap [Wireshark 1.12.0 (v1.12.0-0-g4fab41a from master-1.12)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter:
Expression... Clear Apply Save

```
No.    Time       Source          Destination     Protocol Length Info
    50 28.408379  212.53.40.76    188.40.69.75    RTP       60 PT=opus, SSRC=0x444472E1, Seq=6, Time=72960
    51 28.408429  188.40.69.75    92.127.221.146  UDP       74 Source port: 31030  Destination port: 58732
    52 28.421925  92.127.221.146  188.40.69.75    UDP      112 Source port: 58732  Destination port: 31030
    53 28.424160  92.127.221.146  188.40.69.75    UDP      150 Source port: 58732  Destination port: 31030
    54 28.424645  188.40.69.75    212.53.40.76    RTP      144 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=5, Time=28
    55 28.426413  212.53.40.76    188.40.69.75    RTP       60 PT=opus, SSRC=0x444472E1, Seq=7, Time=73920
    56 28.428409  188.40.69.75    92.127.221.146  UDP       74 Source port: 31030  Destination port: 58732
    57 28.445036  92.127.221.146  188.40.69.75    UDP      151 Source port: 58732  Destination port: 31030
    58 28.445568  188.40.69.75    212.53.40.76    RTP      145 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=6, Time=28
    59 28.446253  212.53.40.76    188.40.69.75    RTP       60 PT=opus, SSRC=0x444472E1, Seq=8, Time=74880
    60 28.448409  188.40.69.75    92.127.221.146  UDP       74 Source port: 31030  Destination port: 58732
    61 28.456185  92.127.221.146  188.40.69.75    UDP      144 Source port: 58732  Destination port: 31030
    62 28.456722  188.40.69.75    212.53.40.76
    63 28.466759  212.53.40.76    188.40.69.75
    64 28.468401  188.40.69.75    92.127.221.146
    65 28.475196  92.127.221.146  188.40.69.75
    66 28.475752  188.40.69.75    212.53.40.76
    67 28.487142  212.53.40.76    188.40.69.75
    68 28.488367  188.40.69.75    92.127.221.146
    69 28.497188  92.127.221.146  188.40.69.75
    70 28.497731  188.40.69.75    212.53.40.76
    71 28.498321  212.53.40.76    188.40.69.75
    72 28.508374  188.40.69.75    92.127.221.146
    73 28.515498  92.127.221.146  188.40.69.75
    74 28.516051  188.40.69.75    212.53.40.76
    75 28.517377  212.53.40.76    188.40.69.75
    76 28.528433  188.40.69.75    92.127.221.146
```

```
0000  00 21 59 c5 74 e0 00 24  21 9c 37 ed 08 00 45
0010  00 3c 00 00 40 00 40 11  ff 2b bc 28 45 4b 5c
0020  dd 92 79 36 e5 6c 00 28  ad 52 90 6f 00 05 00
0030  1d 00 3b 35 9c a0 03 e7  00 00 41 5f 46 b5 8f
0040  d1 2a 16 31 ec d3 7d 41  c6 29
```

Wireshark: Decode As

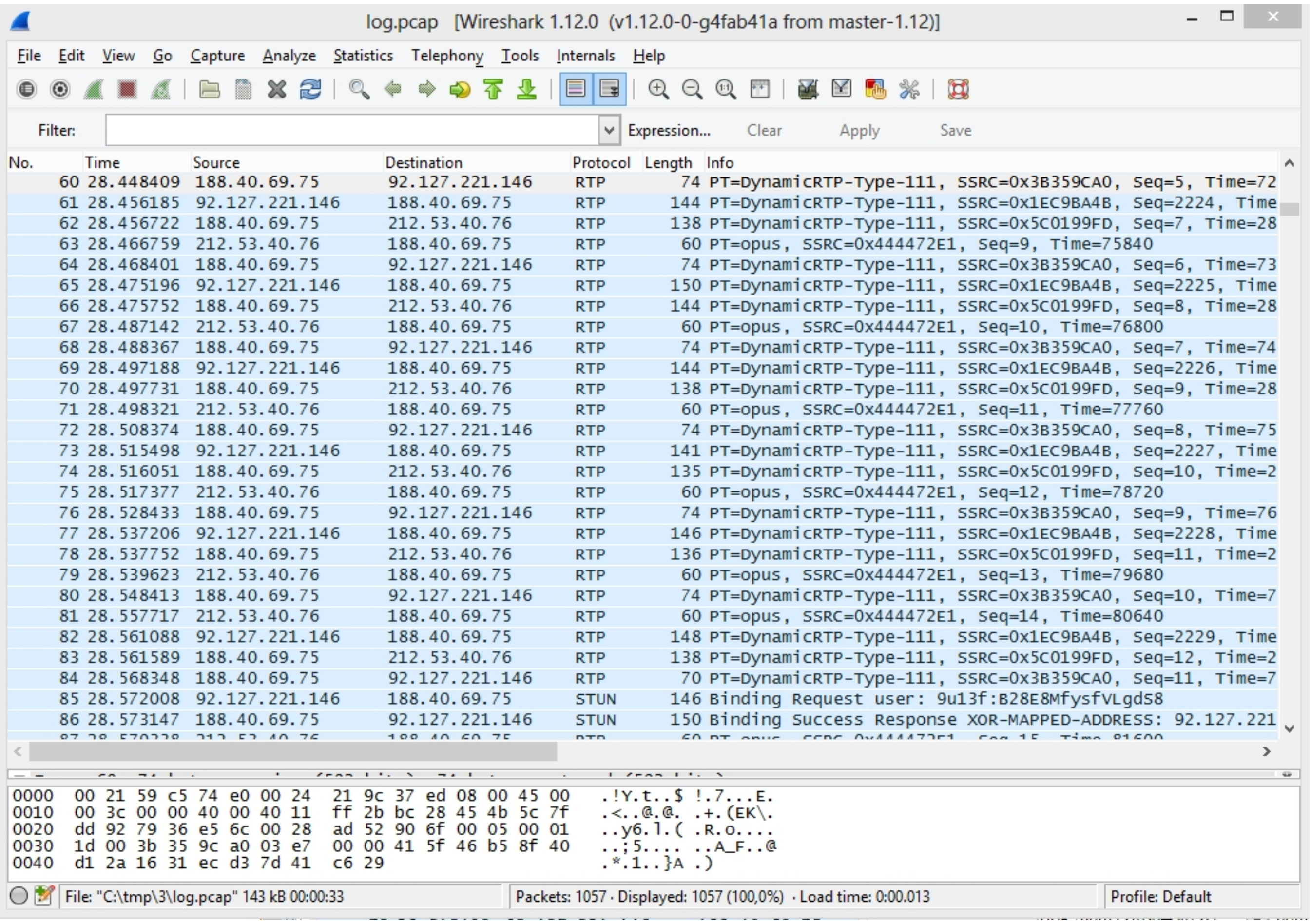
● Decode
○ Do not decode

Transport: UDP Both (31030↔58732) port(s) as RTP

File: "C:\tmp\3\log.pcap" 143 kB 00:00:33 | Packets: 1057 · Displayed: 1057 (100,0%) · Load time: 0:00.011 | Profile: Default

Decoded SRTP traffic

As a result of decoding the protocol, Wireshark will display the decoded SRTP traffic:



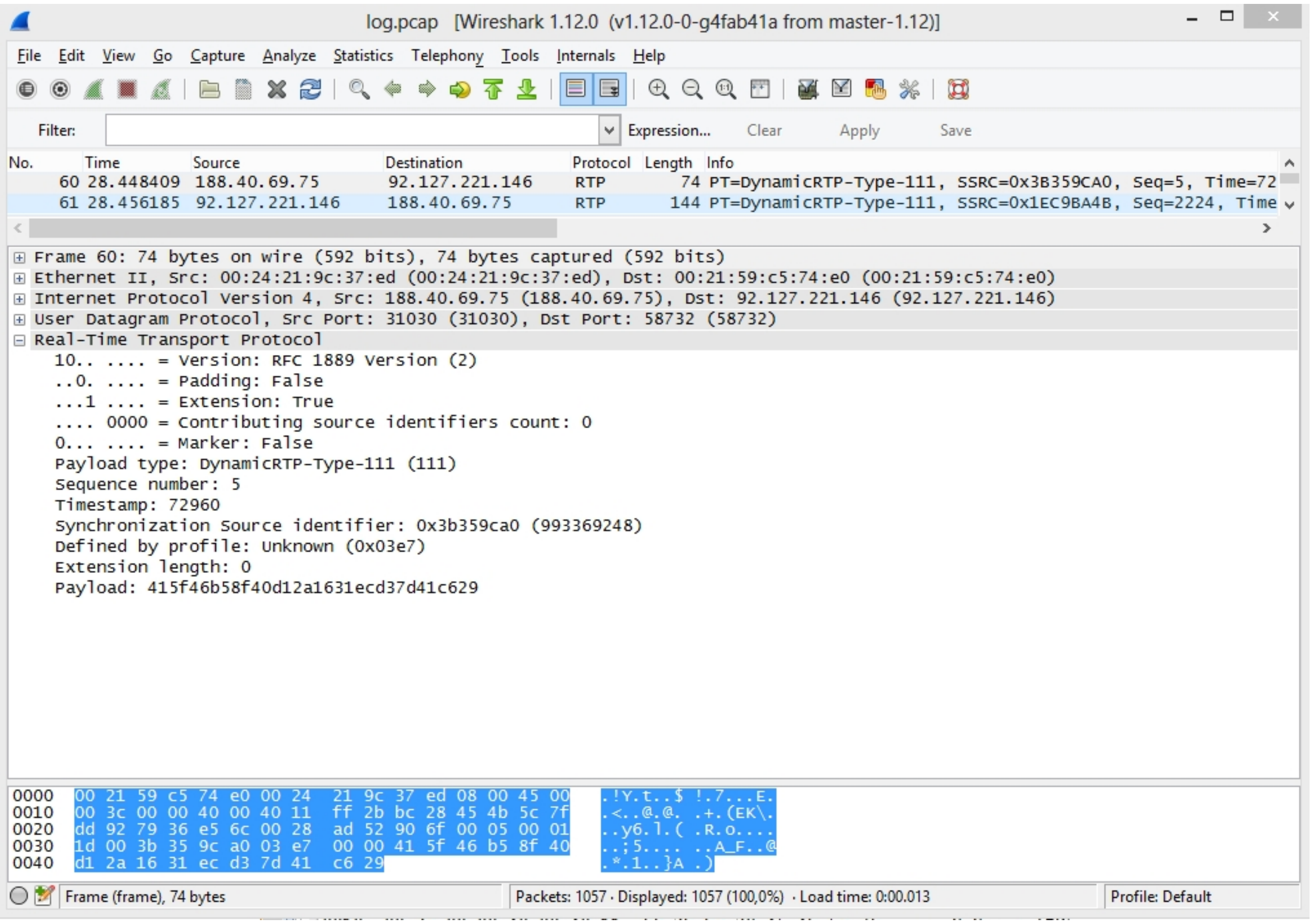
```
No.     Time        Source            Destination       Protocol  Length  Info
     60 28.448409   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=5, Time=72
     61 28.456185   92.127.221.146    188.40.69.75      RTP       144 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2224, Time
     62 28.456722   188.40.69.75      212.53.40.76      RTP       138 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=7, Time=28
     63 28.466759   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=9, Time=75840
     64 28.468401   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=6, Time=73
     65 28.475196   92.127.221.146    188.40.69.75      RTP       150 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2225, Time
     66 28.475752   188.40.69.75      212.53.40.76      RTP       144 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=8, Time=28
     67 28.487142   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=10, Time=76800
     68 28.488367   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=7, Time=74
     69 28.497188   92.127.221.146    188.40.69.75      RTP       144 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2226, Time
     70 28.497731   188.40.69.75      212.53.40.76      RTP       138 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=9, Time=28
     71 28.498321   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=11, Time=77760
     72 28.508374   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=8, Time=75
     73 28.515498   92.127.221.146    188.40.69.75      RTP       141 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2227, Time
     74 28.516051   188.40.69.75      212.53.40.76      RTP       135 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=10, Time=2
     75 28.517377   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=12, Time=78720
     76 28.528433   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=9, Time=76
     77 28.537206   92.127.221.146    188.40.69.75      RTP       146 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2228, Time
     78 28.537752   188.40.69.75      212.53.40.76      RTP       136 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=11, Time=2
     79 28.539623   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=13, Time=79680
     80 28.548413   188.40.69.75      92.127.221.146    RTP        74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=10, Time=7
     81 28.557717   212.53.40.76      188.40.69.75      RTP        60 PT=opus, SSRC=0x444472E1, Seq=14, Time=80640
     82 28.561088   92.127.221.146    188.40.69.75      RTP       148 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2229, Time
     83 28.561589   188.40.69.75      212.53.40.76      RTP       138 PT=DynamicRTP-Type-111, SSRC=0x5C0199FD, Seq=12, Time=2
     84 28.568348   188.40.69.75      92.127.221.146    RTP        70 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=11, Time=7
     85 28.572008   92.127.221.146    188.40.69.75      STUN      146 Binding Request user: 9u13f:B28E8MfysfVLgdS8
     86 28.573147   188.40.69.75      92.127.221.146    STUN      150 Binding Success Response XOR-MAPPED-ADDRESS: 92.127.221
```

```
0000  00 21 59 c5 74 e0 00 24  21 9c 37 ed 08 00 45 00   .!Y.t..$ !.7...E.
0010  00 3c 00 00 40 00 40 11  ff 2b bc 28 45 4b 5c 7f   .<..@.@. .+.(EK\.
0020  dd 92 79 36 e5 6c 00 28  ad 52 90 6f 00 05 00 01   ..y6.l.( .R.o....
0030  1d 00 3b 35 9c a0 03 e7  00 00 41 5f 46 b5 8f 40   ..;5.... ..A_F..@
0040  d1 2a 16 31 ec d3 7d 41  c6 29                     .*.1..}A .)
```

File: "C:\tmp\3\log.pcap" 143 kB 00:00:33 | Packets: 1057 · Displayed: 1057 (100,0%) · Load time: 0:00.013 | Profile: Default

SRTP packet header

SRTP traffic is encrypted. This means if you try to play it, you will hear noises instead of normal speech. But only the content traffic is encrypted. The main RTP headers remain non-encrypted and they can be seen in the RTP packet. This is handy to analyze SRTP traffic parameters. The below example shows an SRTP packet with Payload Type, Sequence Number, Timestamp, SSRC.



log.pcap [Wireshark 1.12.0 (v1.12.0-0-g4fab41a from master-1.12)]
File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help
Filter:
Expression...
Clear
Apply
Save

```
No.  Time       Source          Destination     Protocol Length Info
  60 28.448409  188.40.69.75    92.127.221.146  RTP          74 PT=DynamicRTP-Type-111, SSRC=0x3B359CA0, Seq=5, Time=72
  61 28.456185  92.127.221.146  188.40.69.75    RTP         144 PT=DynamicRTP-Type-111, SSRC=0x1EC9BA4B, Seq=2224, Time
```

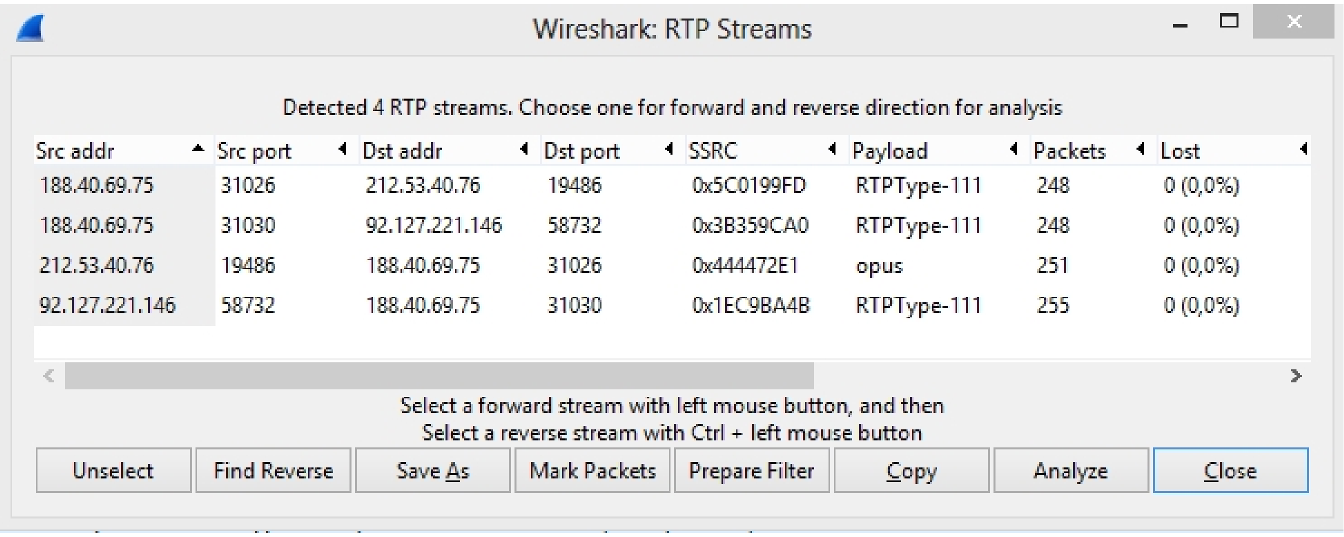
```
⊞ Frame 60: 74 bytes on wire (592 bits), 74 bytes captured (592 bits)
⊞ Ethernet II, Src: 00:24:21:9c:37:ed (00:24:21:9c:37:ed), Dst: 00:21:59:c5:74:e0 (00:21:59:c5:74:e0)
⊞ Internet Protocol Version 4, Src: 188.40.69.75 (188.40.69.75), Dst: 92.127.221.146 (92.127.221.146)
⊞ User Datagram Protocol, Src Port: 31030 (31030), Dst Port: 58732 (58732)
⊟ Real-Time Transport Protocol
    10.. .... = Version: RFC 1889 Version (2)
    ..0. .... = Padding: False
    ...1 .... = Extension: True
    .... 0000 = Contributing source identifiers count: 0
    0... .... = Marker: False
    Payload type: DynamicRTP-Type-111 (111)
    Sequence number: 5
    Timestamp: 72960
    Synchronization Source identifier: 0x3b359ca0 (993369248)
    Defined by profile: Unknown (0x03e7)
    Extension length: 0
    Payload: 415f46b58f40d12a1631ecd37d41c629
```

```
0000  00 21 59 c5 74 e0 00 24  21 9c 37 ed 08 00 45 00   .!Y.t..$ !.7...E.
0010  00 3c 00 00 40 00 40 11  ff 2b bc 28 45 4b 5c 7f   .<..@.@. .+.(EK\.
0020  dd 92 79 36 e5 6c 00 28  ad 52 90 6f 00 05 00 01   ..y6.l.( .R.o....
0030  1d 00 3b 35 9c a0 03 e7  00 00 41 5f 46 b5 8f 40   ..;5.... ..A_F..@
0040  d1 2a 16 31 ec d3 7d 41  c6 29                     .*.1..}A .)
```

Frame (frame), 74 bytes | Packets: 1057 · Displayed: 1057 (100,0%) · Load time: 0:00.013 | Profile: Default

The list of SRTP and RTP streams taking part in a WebRTC session

SRTP and RTP streams can be analyzed using Wireshark. To do this, use the 'Telephony - RTP - Show All Streams' menu.



Detected 4 RTP streams. Choose one for forward and reverse direction for analysis

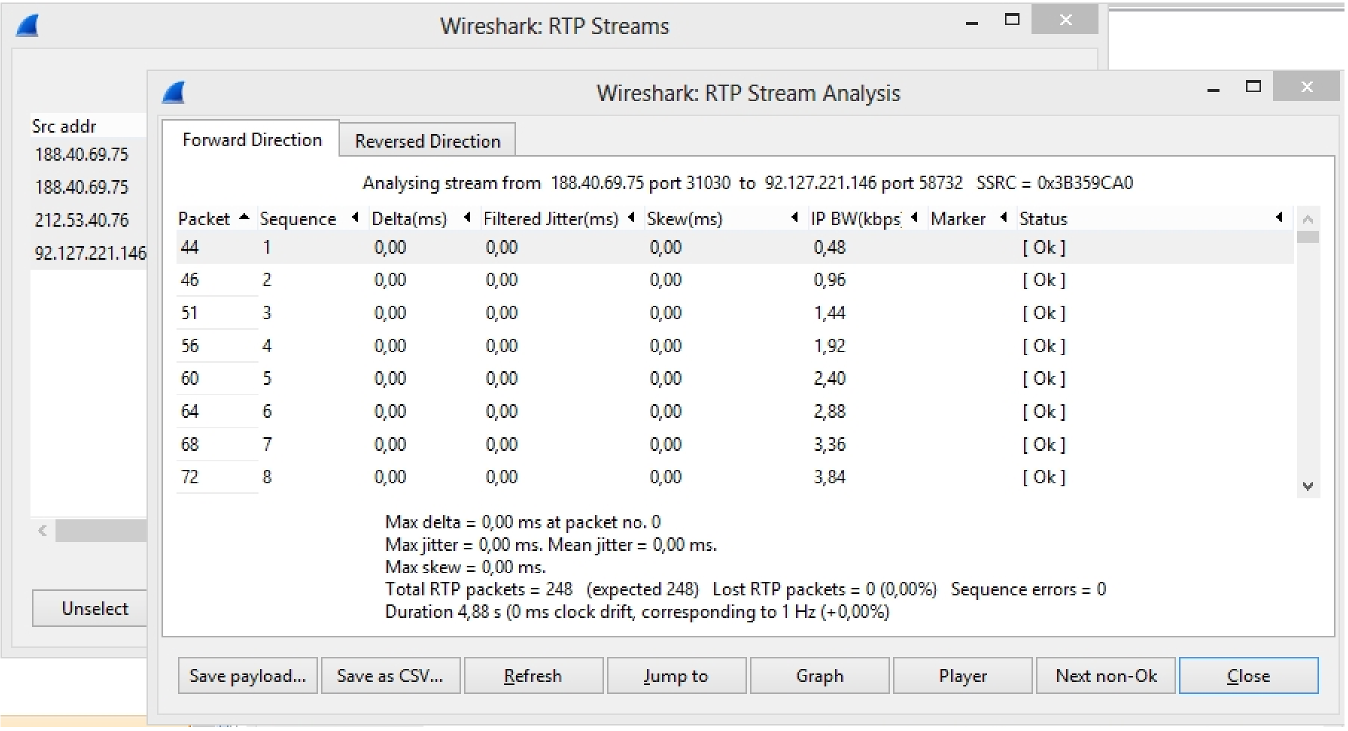
Src addr	Src port	Dst addr	Dst port	SSRC	Payload	Packets	Lost
188.40.69.75	31026	212.53.40.76	19486	0x5C0199FD	RTPType-111	248	0 (0,0%)
188.40.69.75	31030	92.127.221.146	58732	0x3B359CA0	RTPType-111	248	0 (0,0%)
212.53.40.76	19486	188.40.69.75	31026	0x444472E1	opus	251	0 (0,0%)
92.127.221.146	58732	188.40.69.75	31030	0x1EC9BA4B	RTPType-111	255	0 (0,0%)

Select a forward stream with left mouse button, and then
Select a reverse stream with Ctrl + left mouse button

In this case, streams with SSRC 0x3B359CA0 and 0x1EC9BA4B are SRTP streams between the web browser and WCS, because the source and destination address is the IP address of the web client (we know it beforehand). The other two streams, specifically, the first and the third ones from the top, are RTP streams between WCS and the SIP server (we know addresses of the WCS server and the SIP server too).

SRTP stream analysis

As described above, SRTP packet headers are not encrypted, so the SRTP stream is available for analysis of quality, losses, jitter, latency just like a conventional RTP stream:



Src addr
188.40.69.75
188.40.69.75
212.53.40.76
92.127.221.146

Analysing stream from 188.40.69.75 port 31030 to 92.127.221.146 port 58732 SSRC = 0x3B359CA0

Packet	Sequence	Delta(ms)	Filtered Jitter(ms)	Skew(ms)	IP BW(kbps	Marker	Status
44	1	0,00	0,00	0,00	0,48		[Ok]
46	2	0,00	0,00	0,00	0,96		[Ok]
51	3	0,00	0,00	0,00	1,44		[Ok]
56	4	0,00	0,00	0,00	1,92		[Ok]
60	5	0,00	0,00	0,00	2,40		[Ok]
64	6	0,00	0,00	0,00	2,88		[Ok]
68	7	0,00	0,00	0,00	3,36		[Ok]
72	8	0,00	0,00	0,00	3,84		[Ok]

```
Max delta = 0,00 ms at packet no. 0
Max jitter = 0,00 ms. Mean jitter = 0,00 ms.
Max skew = 0,00 ms.
Total RTP packets = 248   (expected 248)   Lost RTP packets = 0 (0,00%)   Sequence errors = 0
Duration 4,88 s (0 ms clock drift, corresponding to 1 Hz (+0,00%)
```