به نام خدا

HW2

Computer network

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Contents

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1.1

a)

Wireshark · Protocol Hierarchy Statistics · Wi-Fi

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s
Frame	100.0	12	100.0	2219	4153	0	0	0
Ethernet	100.0	12	7.6	168	314	0	0	0
Internet Protocol Version 4	100.0	12	10.8	240	449	0	0	0
User Datagram Protocol	100.0	12	4.3	96	179	0	0	0
Domain Name System	100.0	12	77.3	1715	3210	12	1715	3210

b)

Here my computer requested a cite two times, and DNS responded to it, and then it requested a different type, and it answered and got an IP.

In the end, it requested mail, internship, and cabinet, but it responded with no.

dns

No.	Time	Source	Destination	Protocol	Length	Info
58	1.330212	192.168.1.6	37.152.182.112	DNS	73	Standard query 0x3925 A ce.sharif.edu
72	1.621610	37.152.182.112	192.168.1.6	DNS	508	Standard query response 0x3925 A ce.sharif.edu A 81.31.168.124 NS b.root-servers.net NS c.root-servers.net NS d.root-servers.net NS …
106	2.524223	192.168.1.6	37.152.182.112	DNS	73	Standard query 0xbfac A ce.sharif.edu
109	2.561485	37.152.182.112	192.168.1.6	DNS	508	Standard query response 0xbfac A ce.sharif.edu A 81.31.168.124 NS l.root-servers.net NS m.root-servers.net NS a.root-servers.net NS …
110	2.563026	192.168.1.6	37.152.182.112	DNS	73	Standard query 0x793d AAAA ce.sharif.edu
114	2.671388	37.152.182.112	192.168.1.6	DNS	492	Standard query response 0x793d AAAA ce.sharif.edu NS m.root-servers.net NS a.root-servers.net NS b.root-servers.net NS c.root-server…
406	5.350579	192.168.1.6	37.152.182.112	DNS	85	Standard query 0x0197 A internship.cse.sharif.edu
407	5.350579	192.168.1.6	37.152.182.112	DNS	79	Standard query 0x3c67 A mail.cse.sharif.edu
408	5.350664	192.168.1.6	37.152.182.112	DNS	82	Standard query 0x20cc A cabinet.cse.sharif.edu
410	5.383368	37.152.182.112	192.168.1.6	DNS	79	Standard query response 0x3c67 No such name A mail.cse.sharif.edu
411	5.383918	37.152.182.112	192.168.1.6	DNS	85	Standard query response 0x0197 No such name A internship.cse.sharif.edu
430	5.604031	37.152.182.112	192.168.1.6	DNS	82	Standard query response 0x20cc No such name A cabinet.cse.sharif.edu

Wireshark · DNS · Wi-Fi

Topic / Item	Count	Average	Min Val	Max Val	Rate (ms)	Percent	Burst Rate	Burst Start
Total Packets	12				0.0028	100%	0.0500	5.351
rcode	12				0.0028	100.00%	0.0500	5.351
No such name	3				0.0007	25.00%	0.0200	5.383
No error	9				0.0021	75.00%	0.0300	2.524
opcodes	12				0.0028	100.00%	0.0500	5.351
Standard query	12				0.0028	100.00%	0.0500	5.351
Query/Response	12				0.0028	100.00%	0.0500	5.351
Response	6				0.0014	50.00%	0.0200	5.383
Query	6				0.0014	50.00%	0.0300	5.351
Query Type	12				0.0028	100.00%	0.0500	5.351
AAAA (IPv6 Address)	2				0.0005	16.67%	0.0100	2.563
A (Host Address)	10				0.0023	83.33%	0.0500	5.351
Class	12				0.0028	100.00%	0.0500	5.351
IN	12				0.0028	100.00%	0.0500	5.351
Service Stats	0				0.0000	100%	-	-
request-response time (msec)	6	126.09	32.789001	291.398010	0.0014		0.0200	5.383
no. of unsolicited responses	0				0.0000		-	-
no. of retransmissions	0				0.0000		-	-
Response Stats	0				0.0000	100%	-	-
no. of questions	12	1.00	1	1	0.0028		0.0400	5.383
no. of authorities	12	6.50	0	13	0.0028		0.0400	5.383
no. of answers	12	0.33	0	1	0.0028		0.0400	5.383
no. of additionals	12	6.50	0	13	0.0028		0.0400	5.383
Query Stats	0				0.0000	100%	-	-
Qname Len	6	17.50	13	25	0.0014		0.0300	5.351
Label Stats	0				0.0000		-	-
4th Level or more	3				0.0007		0.0300	5.351
3rd Level	3				0.0007		0.0200	2.524
2nd Level	0				0.0000		-	-
1st Level	0				0.0000		-	-
Payload size	12	142.92	31	466	0.0028	100%	0.0500	5.351

1.2

a)

89.34% for 185.231.182.126 (noyan abr arvan)

99.45% for 192.168.1.6(my ip)

	Dadeh Gostar Asr Novin P.J.S. Co.				
185.231.182.126	202468 Noyan Abr Arvan Co. (Private Joint Stock)	—	8 months ago	valid	100 %	Whois

Wireshark · All Addresses · Wi-Fi

Topic / Item	Count	Average	Min Val	Max Val	Rate (ms)	Percent	Burst Rate	Burst Start
95.101.23.233	15				0.0003	0.08%	0.0200	41.703
95.101.23.10	13				0.0003	0.07%	0.0800	11.898
95.100.209.79	7				0.0002	0.04%	0.0600	17.910
95.100.209.151	26				0.0006	0.13%	0.0200	7.843
93.184.220.29	38				0.0009	0.19%	0.0300	39.848
72.34.250.75	7				0.0002	0.04%	0.0300	0.327
69.173.144.139	8				0.0002	0.04%	0.0100	9.247
64.74.236.159	28				0.0006	0.14%	0.0500	2.365
54.85.65.24	16				0.0004	0.08%	0.0200	8.835
54.81.58.130	6				0.0001	0.03%	0.0300	3.039
54.151.203.34	20				0.0004	0.10%	0.0300	2.446
52.85.6.33	32				0.0007	0.16%	0.0900	25.747
52.57.220.220	25				0.0006	0.13%	0.1000	41.549
52.4.166.83	34				0.0008	0.17%	0.1200	14.886
52.222.232.221	37				0.0008	0.19%	0.1000	31.167
52.210.15.1	51				0.0011	0.26%	0.1300	14.087
51.89.9.251	10				0.0002	0.05%	0.0600	29.566
37.252.172.45	15				0.0003	0.08%	0.0300	39.589
37.157.6.248	10				0.0002	0.05%	0.0700	29.369
37.152.182.112	114				0.0026	0.57%	0.0900	41.247
35.244.159.8	16				0.0004	0.08%	0.1100	41.460
35.186.224.47	15				0.0003	0.08%	0.0400	16.519
35.186.224.25	11				0.0002	0.06%	0.0600	15.727
35.165.182.128	3				0.0001	0.02%	0.0200	13.178
34.253.119.129	4				0.0001	0.02%	0.0300	3.748
34.237.23.137	6				0.0001	0.03%	0.0300	4.501
34.120.208.123	3				0.0001	0.02%	0.0200	30.724
34.117.237.239	21				0.0005	0.11%	0.0600	11.397
34.107.148.139	15				0.0003	0.08%	0.0800	41.363
3.124.9.195	8				0.0002	0.04%	0.0300	13.992
255.255.255.255	35				0.0008	0.18%	0.0100	0.000
239.255.255.250	72				0.0016	0.36%	0.4400	26.012
23.47.217.34	31				0.0007	0.16%	0.0800	41.601
23.14.230.130	15				0.0003	0.08%	0.0500	42.657
224.0.0.251	2				0.0000	0.01%	0.0100	14.159
216.58.206.200	3				0.0001	0.02%	0.0200	33.744
216.52.2.39	20				0.0004	0.10%	0.0800	13.723
213.19.162.31	46				0.0010	0.23%	0.0900	41.410
209.54.176.128	10				0.0002	0.05%	0.0100	2.882
204.79.197.219	2				0.0000	0.01%	0.0100	36.672
2.19.51.210	38				0.0009	0.19%	0.0200	41.690
2.18.195.226	11				0.0002	0.06%	0.0200	3.206

Display filter:

Wireshark · All Addresses · Wi-Fi

Topic / Item	Count	Average	Min Val	Max Val	Rate (ms)	Percent	Burst Rate	Burst Start
185.86.139.57	8				0.0002	0.04%	0.0500	9.526
185.86.139.103	8				0.0002	0.04%	0.0600	8.343
185.64.189.112	11				0.0002	0.06%	0.0400	41.247
185.33.221.15	281				0.0063	1.41%	0.0700	17.710
185.33.220.145	44				0.0010	0.22%	0.0300	18.418
185.29.134.248	8				0.0002	0.04%	0.0100	7.993
185.231.182.126	25				0.0006	0.13%	0.0300	41.510
185.183.112.148	6				0.0001	0.03%	0.0400	4.103
185.126.18.14	17821				0.4003	89.34%	1.6900	16.496
18.64.84.220	47				0.0011	0.24%	0.0300	2.756
18.64.79.112	2				0.0000	0.01%	0.0100	10.872
18.202.156.139	3				0.0001	0.02%	0.0200	0.598
18.156.0.31	7				0.0002	0.04%	0.0600	28.694
178.250.2.151	9				0.0002	0.05%	0.0600	9.087
172.64.155.188	20				0.0004	0.10%	0.0200	2.001
172.217.20.78	9				0.0002	0.05%	0.0600	3.780
172.217.20.66	32				0.0007	0.16%	0.1600	43.436
172.217.17.98	107				0.0024	0.54%	0.2500	20.134
172.217.17.132	10				0.0002	0.05%	0.0300	26.813
172.217.169.102	111				0.0025	0.56%	0.1400	40.497
162.159.136.234	6				0.0001	0.03%	0.0200	11.305
162.159.135.232	9				0.0002	0.05%	0.0400	15.887
162.159.130.235	8				0.0002	0.04%	0.0700	7.068
156.146.52.15	120				0.0027	0.60%	0.5200	0.173
152.199.19.160	2				0.0000	0.01%	0.0200	22.401
151.101.2.219	23				0.0005	0.12%	0.0600	38.409
145.40.89.200	73				0.0016	0.37%	0.0300	8.458
143.204.93.3	5				0.0001	0.03%	0.0400	41.413
142.250.187.163	38				0.0009	0.19%	0.0400	42.686
142.250.187.142	8				0.0002	0.04%	0.0300	3.898
142.250.187.130	53				0.0012	0.27%	0.2300	41.122
142.132.187.20	16				0.0004	0.08%	0.0600	22.262
141.95.98.67	6				0.0001	0.03%	0.0400	0.797
13.250.192.86	17				0.0004	0.09%	0.1100	41.557
13.224.194.195	30				0.0007	0.15%	0.1800	13.601
124.146.215.51	14				0.0003	0.07%	0.0500	14.585
108.177.127.154	3				0.0001	0.02%	0.0200	41.659
104.96.93.139	10				0.0002	0.05%	0.0600	16.410
104.96.145.246	10				0.0002	0.05%	0.0100	2.199
104.84.99.100	2				0.0000	0.01%	0.0200	4.577
104.103.72.218	2				0.0000	0.01%	0.0100	6.244

Display filter:

Wireshark · All Addresses · Wi-Fi

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216.52.2.39	20				0.0004	0.10%	0.0800	13.723
213.19.162.31	46				0.0010	0.23%	0.0900	41.410
209.54.176.128	10				0.0002	0.05%	0.0100	2.882
204.79.197.219	2				0.0000	0.01%	0.0100	36.672
2.19.51.210	38				0.0009	0.19%	0.0200	41.690
2.18.195.226	11				0.0002	0.06%	0.0200	3.206
2.16.10.153	13				0.0003	0.07%	0.0700	12.399
198.148.27.140	9				0.0002	0.05%	0.0600	8.824
193.0.160.128	3				0.0001	0.02%	0.0100	8.274
192.168.1.6	19839				0.4457	99.45%	1.7700	16.496
192.168.1.4	37				0.0008	0.19%	0.0100	0.000
192.168.1.2	2				0.0000	0.01%	0.0100	14.159
192.168.1.1	70				0.0016	0.35%	0.4400	26.012
185.86.139.57	8				0.0002	0.04%	0.0500	9.526
185.86.139.103	8				0.0002	0.04%	0.0600	8.343
185.64.189.112	11				0.0002	0.06%	0.0400	41.247
185.33.221.15	281				0.0063	1.41%	0.0700	17.710
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185.183.112.148	6				0.0001	0.03%	0.0400	4.103
185.126.18.14	17821				0.4003	89.34%	1.6900	16.496
18.64.84.220	47				0.0011	0.24%	0.0300	2.756
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162.159.135.232	9				0.0002	0.05%	0.0400	15.887
162.159.130.235	8				0.0002	0.04%	0.0700	7.068
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152.199.19.160	2				0.0000	0.01%	0.0200	22.401
151.101.2.219	23				0.0005	0.12%	0.0600	38.409
145.40.89.200	73				0.0016	0.37%	0.0300	8.458
143.204.93.3	5				0.0001	0.03%	0.0400	41.413
142.250.187.163	38				0.0009	0.19%	0.0400	42.686

Display filter:

b)

Wireshark · Protocol Hierarchy Statistics · Wi-Fi

Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s
Frame	100.0	12	100.0	2219	4153	0	0	0
Ethernet	100.0	12	7.6	168	314	0	0	0
Internet Protocol Version 4	100.0	12	10.8	240	449	0	0	0
User Datagram Protocol	100.0	12	4.3	96	179	0	0	0
Domain Name System	100.0	12	77.3	1715	3210	12	1715	3210

Transmission control protocol: It only used TCP to have more speed and test speed better.

c)

throughput:

The amount of data that may be carried from source to destination in a particular amount of time is referred to as throughput.

The number of packets that successfully arrive at their destinations is measured by throughput.

delay:

Delay in data networks is generally the round trip delay (also called Round Trip Time - RTT) for a packet within the network

Throughput delay:

delay for a packet that successfully arrive at their destinations.

bandwidth:

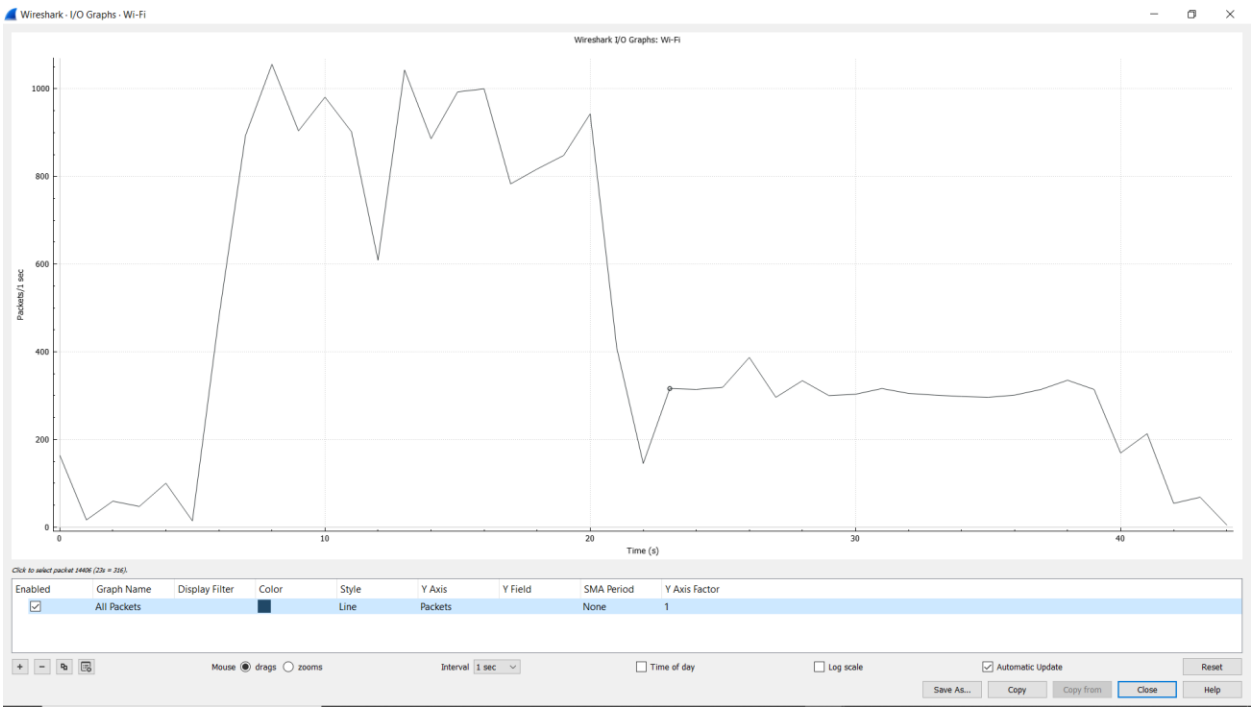
The amount of data that can be supplied and received at one time is measured by bandwidth.

A network's bandwidth determines how much data it can send and receive.

The term bandwidth refers to the capacity of a system rather than its speed.

d)

about 800 for download and 300 for upload



bandwidth

througput delay: We check the time between the same seqnum that it sends, and my computer sends it back. (About 0.07)

2 RTMP

a)

The Real-Time Messaging Protocol (RTMP) is a protocol that allows you to send messages in real time. Real-time audio, video, and data communication is made easier with this protocol.

Because of its ability to maintain low-latency connections, it is an essential part of live streaming technology.
Although RTMP is a useful protocol, it has disadvantages such as bandwidth difficulties and compatibility limits, and it is not supported by HTML5.

When transmitting data, RTMP needs a three-way handshake because it is built on top of the Transmission Control Protocol (TCP).

The initiator (client) requests that the accepter (server) establish a connection; the accepter answers; and the initiator accepts the response and establishes a connection between the two ends.

As a result, RTMP is extremely dependable.

b)

It's an Adobe-developed **application layer** private protocol for audio and video data communication between Flash players and servers.

c)

TCP connections are created between the client and the server before packets are sent.

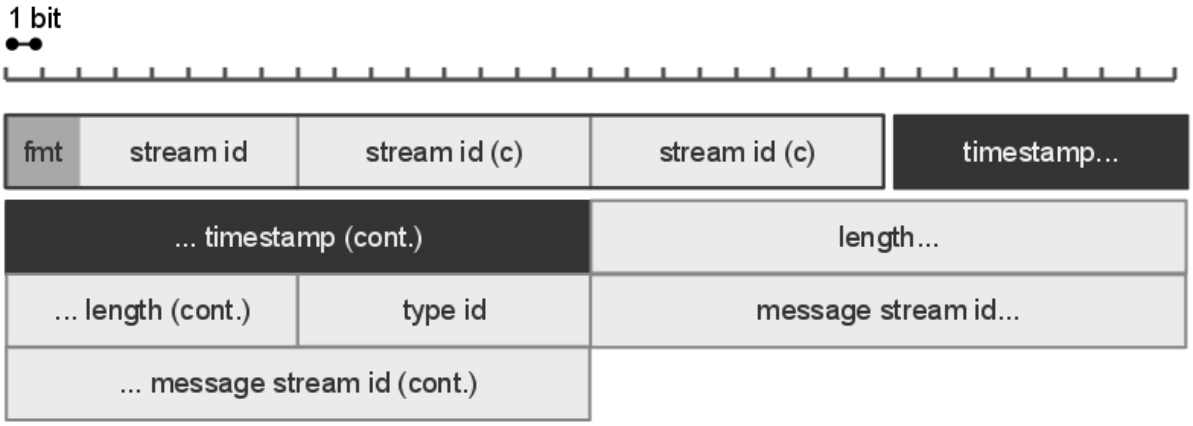
They have a header and a body, which is encoded using the Action Message Format in the case of connection and control commands (AMF). Basic Header and Chunk Message Header are two parts of the header:

1) The Basic Header is the sole unchanging element of the packet and is normally made up of a single composite byte, with the Chunk Type (fmt in the specification) and the rest forming the Stream ID.

   Some fields of the Message Header can be omitted and their value derived from previous packets depending on the value of the former, while the Basic Header can be extended with one or two extra bytes depending on the value of the latter.

   If the remaining six bits of the Basic Header (BH) (least significant) are 0, then the BH is two bytes and represents from Stream ID 64 to 319; if the value is 1, then the BH is three bytes and represents from Stream ID 64 to 65599; if the value is 2, then the BH is one byte and is reserved for low-level protocol

2) The Chunk Message Header includes meta-data such the message size (in bytes), the Timestamp Delta, and the Message Type. This last byte determines whether the packet is an audio, video, command, or "low level" RTMP packet like an RTMP Ping.



d)

Following the establishment of a TCP connection, an RTMP connection is formed initially, with each side exchanging three packets as a handshake (also referred to as Chunks in the official documentation).

The client initiates the handshake by sending the C0 and C1 chunks.

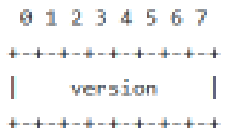
Before transmitting C2, the client MUST wait until S1 has been received.

Before sending any more data, the client MUST wait until S2 has been received.

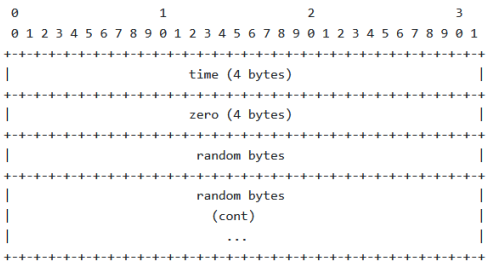
Before sending S0 and S1, the server MUST wait until C0 has been received, and MAY wait until after C1.

Before transmitting S2, the server MUST wait for C1 to arrive.

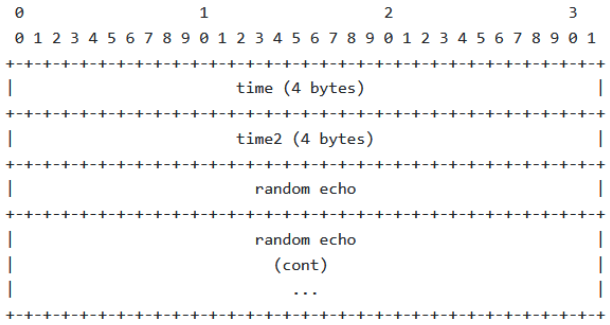
Before sending any more data, the server MUST wait until C2 has been received.



The C0 and S0 packets are a single octet



The C1 and S1 packets are 1536 octets long.



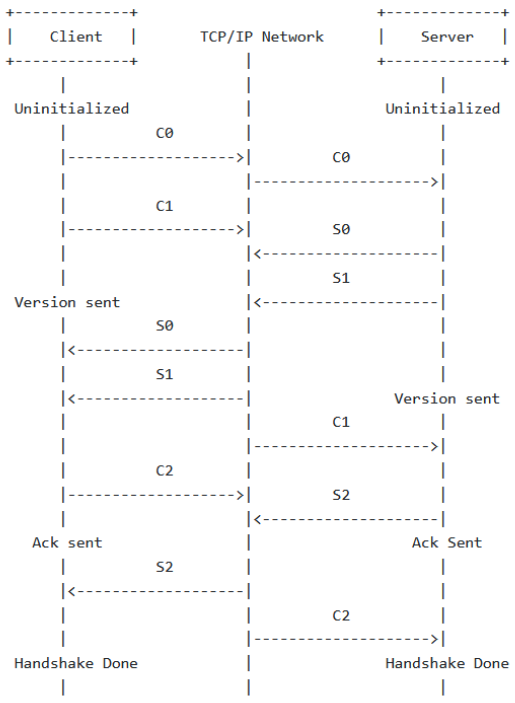
The C2 and S2 packets are 1536 octets long, and nearly an echo of S1 and C1 (respectively).

Uninitialized: The protocol version is sent during this stage. Both the client and server are uninitialized. The The client sends the protocol version in packet C0. If the server supports the version, it sends S0 and S1 in response. If not, the server responds by taking the appropriate action. In RTMP, this action is terminating the connection.

Version Sent: Both client and server are in the Version Sent state after the Uninitialized state. The client is waiting for the packet S1 and the server is waiting for the packet C1. On receiving the awaited packets, the client sends the packet C2 and the server sends the packet S2. The state then becomes Ack Sent.

Ack Sent: The client and the server wait for S2 and C2 respectively.

Handshake Done: The client and the server exchange messages.



Pictorial Representation of Handshake

Some useful sources:

https://rtmp.veriskope.com/docs/spec/

https://segmentfault.com/a/1190000040012870/en

https://en.wikipedia.org/wiki/Real-Time_Messaging_Protocol

https://www.wowza.com/blog/rtmp-streaming-real-time-messaging-protocol