# TCP – Congestion Control Algorithms Network programming in C

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# 1 System Characterization

# 1.1 System Overview

#### 1.1.1 About the System

'TCP – Congestion Control Algorithms Network programming' - like the name of the assignment our program reflects the communication between sender and receiver according to two congestion control algorithms (cubic, reno) while sending the file.

The Sender will send a message in this message will be a file, with at least 1MB size of a file, and the Receiver will receive it and measure the time it took for his program to receive the file. The receiver doesn't really care about saving the file itself (or its content). He just cares about the Data-Frame that he gets.

The file will be sent in two parts first half and second half, each half will be sent according to one of the CC algorithms we learned in the lectures.

The first half will be sent according to CUBIC algorithms and second half will be sent according to RENO algorithm. By this, and because the size of the two half is the same, we can see based on the result which algorithm is better for this present purpose.

In addition, we will use packet lost tools on Linux which is known as TC. We can see the communication and the packet lost by using Wireshark.

# 1.1.2 CC – Algorithm

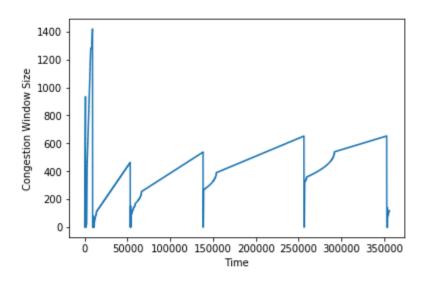
At first let's explain about congestion control, congestion on the internet happens when the computers send more packets to a particular link than that link can handle. If a link is receiving more packets than can fit on the wire, it will begin queueing up those packets, and if the link's queues fill up, the link will begin dropping those packets.

Therefore we have the CC - Algorithm. In this program we use the cubic and reno CC – Algorithm.

#### **RENO:**

The traditional approaches to congestion control in TCP, named Tahoe and Reno, operate by increasing the congestion window size, which you can think of as the "rate" at which senders send packets, exponentially until some threshold is reached. After that threshold is reached, they begin increasing linearly.

Once they experience drops, they will aggressively drop the window size, and then enter "slow start" mode again, where they increase exponentially until they hit the threshold. Once the threshold is hit, they will increase linearly again.



The approaches Tahoe and Reno were developed in the late 80s and 90s, and worked then, but the internet has changed a lot since. Notably, there now exist

longer, and higher bandwidth networks (long, fat networks). To fully take advantage of these networks, TCP senders need to send with much higher congestion windows.

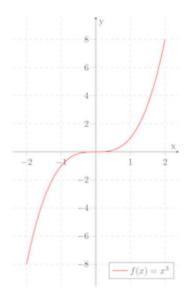
Since Tahoe & Reno grow linearly after crossing the slow start threshold, if a lot more bandwidths become available on a link, it'll take a long time for these algorithms to "discover" that available bandwidth.

#### **CUBIC:**

It turns out that to achieve better performance on "long, fat networks", these congestion control algorithms need to do a better job of "exploring" for more bandwidth.

However, we don't want to overload a network, or aggressively steal away available bandwidth from other senders on the same network.

It turns out that there's a mathematical function for growing the congestion window that satisfies both constraints, the cubic function:



Observe a very powerful property of a cubic function: that as x is lower, t function grows very quickly, and then slows down as it approaches a particular point (the inflection point), and then after crossing that point begins growing quickly again.

Therefore, it's took advantage of this property when designing a congestion control algorithm:

If the congestion window is grown as a cubic function of time since the last packet drop, and the inflection point is set to be the size of the congestion window at the last drop, the window has the following behavior:

- 1. Start growing fast
- 2. As the algorithm approaches the window at the last drop, the congestion window begins growing more slowly
- 3. If the congestion window gets to the point at which drops occurred the last time, and does not experience a drop, begin growing slowly again, but then increase more quickly

The concave portion of this, where the window begins growing quickly but then slows down, and the convex portion of this can be thought of two different phases. During the concave phase, the congestion window is catching up to where a packet was lost last time and slows down its growth to be fair to traditional TCP senders. If the algorithm gets there without experiencing drops, it can move into an "exploratory" phase, in which it grows quickly to discover newly available bandwidth.

#### 1.1.3 How to Install and Run the Program

To test the system for yourself, you would need a Linux based operating system.

#### Instructions:

- 1. Download the following files:
  - a. Sender.c
  - b. Receiver.c
  - c. Makefile
  - d. 1mb.txt
- 2. Put all of the above files in a single directory.
- 3. Open said directory in your Linux terminal.
- 4. Run the following commands:
  - a. sudo apt install build-essential
  - b. Make
  - c. ./Receiver
- 5. Open the same directory in a second Linux terminal.
- 6. Run the following command:
  - a. ./Sender
- 7. Once the sending is completed, you'll be asked if you'd like to resend the file. Type "Y" for 'yes' or "N" for 'no' and press Enter.
- 8. To terminate the program type "N" when a sending session is completed.

# 1.2 System Functionality

#### 1.2.1 Code Description

#### **IMPORTANT!**

We assume that the input is correct and that the user will not repeat sending the file more than 1000 times.

Order of operations: sender's side.

#### File handling:

1. Open the file in order to perform certain functions on it.

```
// (1)
//open a file
FILE *f = fopen(FILE_TO_SEND, "r");
//checking
if (f == NULL) {
    fprintf(stderr, "Error opening file");
    return 1;
}
```

2. calculate and save file size (used for sending the files in two parts of equal size).

```
// (2)
//calculate the file size
fseek(f, 0, SEEK_END);
int fileSize = (int) ftell(f);
fseek(f, 0, SEEK_SET);
```

3. store file contents in char array - preparing for sending

```
// (3)
//put the file in char array
char filedata[fileSize];
fread(filedata, sizeof(char), fileSize, f);
```

#### 4. close the file

```
// (4)
//close the file
fclose(f);
```

#### Socket handling:

5. Open a socket from which to send the file.

```
int sock = socket(AF_INET, SOCK_STREAM, IPPROTO_TCP);
   printf("Could not create socket : %d", errno);
} else printf("New socket opened\n");
struct sockaddr_in serverAddress;
memset(&serverAddress, 0, sizeof(serverAddress));
serverAddress.sin_family = AF_INET;
serverAddress.sin_port = htons(SERVER_PORT);
int rval = inet_pton(AF_INET, (const char *) SERVER_IP_ADDRESS, &serverAddress.sin_addr);
if (rval <= 0) {
   printf("inet_pton() failed");
```

connect said socket to server side using the known server address. (in this case: local host).

```
// (6)

// Make a connection to the server with socket SendingSocket.
int connectResult = connect(sock, (struct sockaddr *) &serverAddress, sizeof(serverAddress));

//checking
if (connectResult == -1) {
    printf("connect() failed with error code : %d", errno);
    close(sock);
    return -1;
} else printf("connected to receiver\n");
```

#### Preparing for sending:

7. initialize agreed upon sign ("signal") which would indicate that the receiving side (server side) acquired the file size information. Then, send the file size using send() method (see explanation below).

```
// (7)
int signal = 0; //agreed upon sign
send(sock, &fileSize, sizeof(int), 0); //send the filesize to the receiver
```

8. receive the agreed upon sign ("signal") from the receiver's side.

```
// (8)
recv(sock, &signal, sizeof(int), 0);//receiving the the agreed sign from "receiver" side
```

Sending both parts and authenticating:

9. set the CC algorithm to "cubic" using setsockopt() function

```
// (9)
char cc_algo[BUFFER_SIZE]; //char array for changing the algorithem
strcpy(cc_algo, "cubic"); //copy the string "cubic" into cc_algo
socklen_t len = strlen(cc_algo); //saving the size of the str in the cc_algo in socklen_t variable
//checking & defult the cubic algorithem
if (setsockopt(sock, IPPROTO_TCP, TCP_CONGESTION, cc_algo, len) == -1) {
    perror("setsockopt");
    return -1;
}
```

10.send part A of the file (determined by setting the length of data to send to (filesize/2)).

```
// (10)
//send the first half of the file
bytesSent = send(sock, filedata, (fileSize / 2), 0);
//checking
if (bytesSent == -1) printf("send() failed with error code : %d", errno);
else if (bytesSent == 0) printf("peer has closed the TCP connection prior to send().\n");
else if (bytesSent < (fileSize / 2))
    printf("sent only %ld bytes from the required %d.\n", bytesSent, (fileSize / 2));
else printf("Sent %ld bytes\n", bytesSent);</pre>
```

11.initialize certain value (in this case: xor(2421, 7494) – last four digits of our ID) then, receive value from receiver and compare for authentication (determining that we sent the first part of the file to the desired receiver).

```
// (11)
int sender_xor = 2421 ^ 7494; //the sender xor for the authentication
int receiver_xor;//the xor that the sender get from the receiver

//receiv the xor from the receiver
recv(sock, &receiver_xor, sizeof(int), 0);
//checking
if (receiver_xor == sender_xor) printf("Part A was successfully sent\n");
else printf("client: something went wrong\n");
```

12.set the CC algorithm to "reno" using setsockopt() function and repeat step

```
// (12)
strcpy(cc_algo, "reno"); //copy the string "reno" into cc_algo
len = strlen(cc_algo); //saving the size of the str in the cc_algo in socklen_t variable
//checking & defult the cubic algorithem
if (setsockopt(sock, IPPROTO_TCP, TCP_CONGESTION, cc_algo, len) != 0) {
    perror("setsockopt");
    return -1;
}

printf("Sending part B using reno CC algorithm\n");

//send the second half of the file
bytesSent = send(sock, filedata + (fileSize / 2) - 1, (fileSize / 2), 0);
//checking
if (bytesSent == -1) printf("send() failed with error code : %d", errno);
else if (bytesSent <= 0) printf("peer has closed the TCP connection prior to send().\n");
else if (bytesSent < (fileSize / 2))
    printf("sent only %ld bytes from the required %d.\n", bytesSent, (fileSize / 2));
else printf("Sent %ld bytes\n", bytesSent);

printf("Part B was successfully sent\n");</pre>
```

13.ask user if he wants to repeat the sending process or end the connection.

```
// (13)
char choose; //the user decision
printf("Send again? Y = yes, N = no\n");
scanf(" %c", &choose);
```

14.repeat process (while loop) as long as the user answers "yes".

Order of operations: receiver's side.

#### Handle socket

 Open a server socket and initialize using sockarddr\_in struct (see below functionality of other functions in use). We also set the enable reuse option using setsockopt() function. This allows reusing the same port for receving multiple sending attempts.

```
int listeningSocket = socket(AF_INET, SOCK_STREAM, IPPROTO_TCP);
if (listeningSocket == -1) {
    printf("Could not create listening socket : %d", errno);
    return 1;
int enableReuse = 1;
int ret = setsockopt(listeningSocket, SOL_SOCKET, SO_REUSEADDR, &enableReuse, sizeof(int));
if (ret < 0) {</pre>
   printf("setsockopt() failed with error code : %d", errno);
struct sockaddr_in serverAddress;
memset(&serverAddress, 0, sizeof(serverAddress));
serverAddress.sin_family = AF_INET;
serverAddress.sin_addr.s_addr = INADDR_ANY;
serverAddress.sin_port = htons(SERVER_PORT); // network order (makes byte order consistent)
```

#### 2. Bind the socket

```
// (2)
// Bind the socket to the port with any IP at this port
int bindResult = bind(listeningSocket, (struct sockaddr *) &serverAddress,
sizeof(serverAddress));
// checking
if (bindResult == -1) {
    printf("Bind failed with error code : %d", errno);
    close(listeningSocket);
    return -1;
} else printf("executed Bind() successfully\n");
```

3. Make socket listen to incoming connections.

```
// (3)
// Make the socket listen.
// 500 is a Maximum size of queue connection requests
// number of concurrent connections = 3
int listenResult = listen(listeningSocket, 3);
//checking
if (listenResult == -1) {
    printf("listen() failed with error code : %d", errno);
    close(listeningSocket);
    return -1;
} else printf("Waiting for incoming TCP-connections...\n");
```

4. Accept incoming connections using accept() method, on a new socket (file descriptor).

```
// (4)
  // accept a connection on a socket
  int clientSocket = accept(listeningSocket, (struct sockaddr *) &clientAddress,
&len_clientAddress);
  // checking
  if (clientSocket == -1) {
      printf("listen failed with error code : %d", errno);
      close(listeningSocket);
      return -1;
  } else printf("A new client connection accepted\n");
```

5. Receive file size info from sender and return agreed upon sign which indicates that the file size is known and the file can be sent.

```
// (5)
int fileSize; // the file size that we receiv from the sender
int signal = 0; // agreed sign

// receive the file size from the sender
recv(clientSocket, &fileSize, sizeof(int), 0);
//send the agreed sign to the sender
send(clientSocket, &signal, sizeof(int), 0);
```

Initialize arrays to store the time data of each attempt at receiving the file,and a counter variable to count the number of attempts.

```
// (6)
long timeOfPartA[1000]; // long array to save the run time of sending partA
bzero(timeOfPartA, 1000); // make a zero array
long timeOfPartB[1000]; // long array to save the run time of sending partB
bzero(timeOfPartB, 1000); // make a zero array
long counter = 0; // present the number of sending the whole file

int running = 1; // stop condition
while (running) {
```

#### Receiving part A:

7. Set the CC algorithm in the listening socket to "cubic" using setsockopt() method (see explanation below) for the retrieval of the first part.

```
// (7)
char cc_algo[BUFFER_SIZE]; // char array for changing the algorithem
printf("Changing to cubic...\n");
strcpy(cc_algo, "cubic"); // copy the string "cubic" into cc_algo
socklen_t len = strlen(cc_algo); // saving the size of the str in the cc_algo in socklen_t variable
// checking & defult the cubic algorithem

if (setsockopt(listeningSocket, IPPROTO_TCP, TCP_CONGESTION, cc_algo, len) == -1) {
    perror("setsockopt");
    return -1;
}
```

8. Initialize buffer with the correct size for receiving the desires part of the file, and initialize a variable to keep track of the number of bytes that were received.

```
// (8)
char buffer[fileSize / 2]; // char array for receiving the half of the file
int totalbytes = 0; // present the bytes that have been received
printf("Waiting for part A...\n");
```

9. Calculate time at the beginning of receiving process.

```
// (9)
struct timeval current_time;//struct for saving current time
gettimeofday(&current_time, NULL);//saving the current time
long before_partA_sec = current_time.tv_sec;//time in second
long before_partA_mic = current_time.tv_usec;//time in microsecond
long total_time_before_partA = before_partA_sec * 1000000 + before_partA_mic;//total time befor
```

10. Receive the bytes sent from "sender" using recv() method (see explanation below. If the connection was lost for some reason than the entire process will be terminated (determined by checking the "running" variable).

```
// (10)
while (totalbytes < (fileSize / 2)) {
    //receive the first part of the file
    int bytesgot = recv(clientSocket, buffer + totalbytes, sizeof(char), 0);
    totalbytes += bytesgot;
    //checking
    if (bytesgot == 0) {
        printf("Connection with sender closed, exiting...\n");
        running = 0;
        break;
    }
}
if (running == 0) break; // quit the program if somthing wrong</pre>
```

11. Calculate time at the end of receiving process.

```
// (11)
gettimeofday(&current_time, NULL); // saving the current time
long after_partA_sec = current_time.tv_sec; // time in second
long after_partA_mic = current_time.tv_usec; // time in microsecond
long total_time_after_partA = after_partA_sec * 1000000 + after_partA_mic; // total time after
long total_time_partA = total_time_after_partA - total_time_before_partA; // tatal time that took part A
timeOfPartA[counter] = total_time_partA; // saving the time in the array

printf("Got part A\n");

printf("Sending authntication check\n");
```

12. Send agreed upon sign for authentication xor(2421 ^ 7494).

```
// (12)
int receiver_xor = 2421 ^ 7494; //the receiver xor
send(clientSocket, &receiver_xor, sizeof(int),
          0);//the receiver send his xor to the sender for the authentication
printf("Authortication sent\n");
```

#### Receiving part B:

13. Changing CC algorithm to Reno in the listening socket, and repeating steps 8-11 for the retrieval of part B.

```
// (13)
printf("Changeing to reno..\n");

strcpy(cc_algo, "reno");//copy the string "reno" into cc_algo
len = strlen(cc_algo);//saving the size of the str in the cc_algo in socklen_t variable
//checking & defult the cubic algorithem
if (setsockopt(listeningSocket, IPPROTO_TCP, TCP_CONGESTION, cc_algo, len) == -1) {
    perror("setsockopt");
    return -1;
}
```

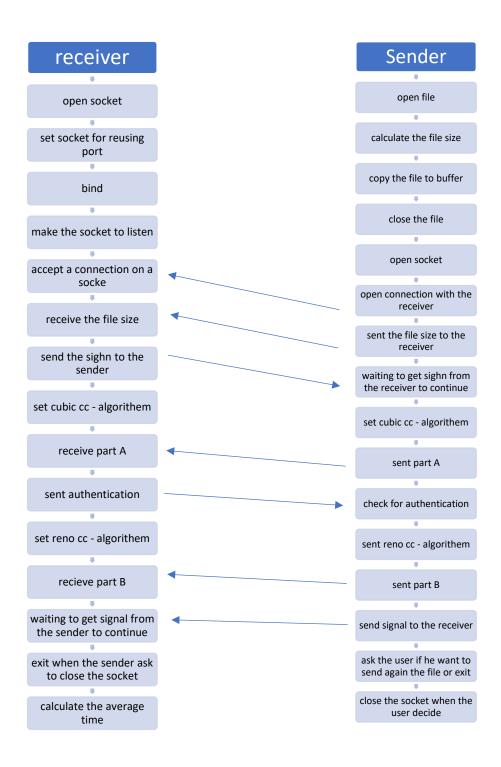
14. Close the connection.

```
printf("Exit\n");
close(clientSocket);//close the clientSocket
close(listeningSocket);//listeningSocket
```

15. Calculate the total time it took to receive each part.

16. Calculate the average receive time for each part using the "counter" variable which indicates the number of times the file was sent.

#### 1.2.2 Flowchart



#### **1.2.3 Output**

Sending the file 5 times.

```
executed Bind() successfully
Waiting for incoming TCP-connections...
A new client connection accepted
Changing to cubic...
Waiting for part A...
Got part A
Sending authntication check
Authortication sent
Changeing to reno..
Waiting for part B...
Got part B
Changing to cubic...
Waiting for part A...
Got part A
Sending authntication check
Authortication sent
Changeing to reno..
Waiting for part B...
Got part B
Changing to cubic...
Waiting for part A...
Got part A
Sending authntication check
Authortication sent
Changeing to reno..
Waiting for part B...
Got part B
Changing to cubic...
Waiting for part A...
Got part A
Sending authntication check
Authontication sent
Changeing to reno..
Waiting for part B...
Got part B
Changing to cubic...
Waiting for part A...
Got part A
Sending authntication check
Authortication sent
Changeing to reno..
Waiting for part B...
Got part B
Changing to cubic...
Waiting for part A...
Connection with sender closed, exiting...
```

```
New socket opened
connected to server
Sending part A using cubic CC algorithm
Sent 528258 bytes
Part A was successfully sent
Sending part B using reno CC algorithm
Sent 528258 bytes
Part B was successfully sent
Send again? Y = yes, N = no
Sending part A using cubic CC algorithm Sent 528258 bytes
Part A was successfully sent
Sending part B using reno CC algorithm
Sent 528258 bytes
Part B was successfully sent
Send again? Y = yes, N = no
Sending part A using cubic CC algorithm
Sent 528258 bytes
Part A was successfully sent
Sending part B using reno CC algorithm
Sent 528258 bytes
Part B was successfully sent
Send again? Y = yes, N = no
Sending part A using cubic CC algorithm
Sent 528258 bytes
Part A was successfully sent
Sending part B using reno CC algorithm
Sent 528258 bytes
Part B was successfully sent
Send again? Y = yes, N = no
Sending part A using cubic CC algorithm
Sent 528258 bytes
Part A was successfully sent
Sending part B using reno CC algorithm
Sent 528258 bytes
Part B was successfully sent
Send again? Y = yes, N = no
```

#### 1.2.4 Functions

#### **Sender function:**

1.To read the file we created we used the following functions:

stream open functions-

#### FILE \*fopen(const char \*pathname, const char \*mode);

The fopen() function opens the file whose name is the string pointed to by pathname and associates a stream with it.

r - Open text file for reading. The stream is positioned at the beginning of the file.

Upon successful completion fopen(), return a FILE pointer. Otherwise, NULL is returned and errno is set to indicate the error.

• Reposition a stream-

#### int fseek(FILE \*stream, long offset, int whence);

The fseek() function sets the file position indicator for the stream pointed to by stream. The new position, measured in bytes, is obtained by adding offset bytes to the position specified by whence. If whence is set to SEEK\_SET, SEEK\_CUR, or SEEK\_END, the offset is relative to the start of the file, the current position indicator, or end-of-file, respectively. Upon successful completion fseek() return 0.

• Reposition a stream-

#### long ftell(FILE \*stream);

The ftell() function obtains the current value of the file position indicator for the stream pointed to by stream.

Upon successful completion, ftell() returns the current offset. Otherwise, -1 is returned and errno is set to indicate the error.

• Binary stream input/output-

# size\_t fread(void \*ptr, size\_t size, size\_t nmemb, FILE \*stream);

The function fread() reads nmemb items of data, each size bytes long, from the stream pointed to by stream, storing them at the location given by ptr. On success, fread() return the number of items read or written. This number equals the number of bytes transferred only when size is 1. If an error occurs, or the end of the file is reached, the return value is a short

item count (or zero). The file position indicator for the stream is advanced by the number of bytes successfully read or written.

fread() does not distinguish between end-of-file and error, and callers must use feof(3) and ferror(3) to deter-mine which occurred.

Close a stream -

#### int fclose(FILE \*stream);

The fclose() function flushes the stream pointed to by stream and closes the underlying file descriptor. The behavior of fclose() is undefined if the stream parameter is an illegal pointer, or is a descriptor already passed to a previous invocation of fclose().

Upon successful completion, 0 is returned. Otherwise, EOF is returned and errno is set to indicate the error. In either case, any further access (including another call to fclose()) to the stream results in undefined behavior.

The fclose() function may also fail and set errno for any of the errors specified for the routines close(2), write(2), or fflush(3).

- 2. To create a TCP Connection between the sender and receiver we used the following functions:
  - Create an endpoint for communication-

#### int socket(int domain, int type, int protocol);

socket() creates an endpoint for communication and returns a file descriptor that refers to that endpoint. The file descriptor returned by a successful call will be the lowest-numbered file descriptor not currently open for the process.

The domain argument specifies a communication domain; this selects the protocol family which will be used for communication:

AF\_INET - IPv4 Internet protocols.

The socket has the indicated type, which specifies the communication semantics. Currently defined types are:

SOCK\_STREAM - Provides sequenced, reliable, two-way, connection-based byte streams. An out-of-band data transmission mechanism may be supported.

The protocol specifies a particular protocol to be used with the socket. Normally only a single protocol exists to support a particular socket type within a given protocol family, in which case protocol can be specified as 0. However, it is possible that many protocols may exist, in which case a particular protocol must be specified in this manner. In our case is IPPROTO\_TCP.

On success, a file descriptor for the new socket is returned. On error, -1 is returned, and errno is set appropriately.

• Fill memory with a constant byte-

#### void \*memset(void \*s, int c, size\_t n);

The memset() function fills the first n bytes of the memory area pointed to by s with the constant byte c.

The memset() function returns a pointer to the memory area s.

Convert values between host and network byte order-

#### uint16\_t htons(uint16\_t hostshort);

The htons() function converts the unsigned short integer hostshort from host byte order to network byte order.

Convert IPv4 and IPv6 addresses from text to binary form int inet\_pton(int af, const char \*src, void \*dst);

This function converts the character string src into a network address structure in the af address family, then copies the network address structure to dst. The af argument must be either AF\_INET or AF\_INET6. dst is written in network byte order.

In our case the following address families are currently supported:

AF\_INET src points to a character string containing an IPv4 network address in dotted-decimal format, "ddd.ddd.ddd.ddd", where ddd is a decimal number of up to three digits in the range 0 to 255. The address is converted to a struct in\_addr and copied to dst, which must be sizeof(struct in\_addr) (4) bytes (32bits) long.

inet\_pton() returns 1 on success (network address was successfully converted). 0 is returned if src does not contain a character string representing a valid network address in the specified address family. If af does not contain a valid address family, -1 is returned and errno is set to EAFNOSUPPORT.

 Initiate a connection on a socketint connect(int sockfd, const struct sockaddr \*addr, socklen\_t addrlen); The connect() system call connects the socket referred to by the file descriptor sockfd to the address specified by addr. The addrlen argument specifies the size of addr. The format of the address in addr is determined by the address space of the socket sockfd.

If the socket sockfd is of type SOCK\_DGRAM, then addr is the address to which datagrams are sent by default, and the only address from which datagrams are received. If the socket is of type SOCK\_STREAM or SOCK\_SEQPACKET, this call attempts to make a connection to the socket that is bound to the address specified by addr.

If the connection or binding succeeds, zero is returned. On error, -1 is returned, and errno is set appropriately.

- 3. To Send the first and the second part of the file and to check for authentication we used the following functions:
  - Send a message on a socket-

ssize\_t send(int sockfd, const void \*buf, size\_t len, int flags);

send() are used to transmit a message to another socket.

The send() call may be used only when the socket is in a connected state.

The argument sockfd is the file descriptor of the sending socket.

The message is found in buf and has length len.

If the message is too long to pass atomically through the underlying protocol, the error EMSGSIZE is returned, and the message is not transmitted.

No indication of failure to deliver is implicit in a send(). Locally detected errors are indicated by a return value of -1.

When the message does not fit into the send buffer of the socket, send() normally blocks, unless the socket has been placed in nonblocking I/O mode. In nonblocking mode, it would fail with the error EAGAIN or EWOULDBLOCK in this case.

The flags argument is the bitwise OR of zero or more flags. in our case is 0 flag.

On success, these calls return the number of bytes sent. On error, -1 is returned, and errno is set appropriately.

Receive a message from a socket -

#### ssize\_t recv(int sockfd, void \*buf, size\_t len, int flags);

recv() used to receive messages from a socket. They may be used to receive data on both connectionless and connection-oriented sockets. This page first describes common features of all three system calls, and then describes the differences between the calls.

If no messages are available at the socket, the receive calls wait for a message to arrive, unless the socket is nonblocking, in which case the value -1 is returned and the external variable errno is set to EA-GAIN or EWOULDBLOCK. The receive calls normally return any data available, up to the requested amount, rather than waiting for receipt of the full amount requested.

These calls return the number of bytes received, or -1 if an error occurred. In the event of an error, errno is set to indicate the error.

When a stream socket peer has performed an orderly shutdown, the return value will be 0 (the traditional "end-of-file" return).

Datagram sockets in various domains (e.g., the UNIX and Internet domains) permit zero-length datagrams. When such a datagram is received, the return value is 0.

The value 0 may also be returned if the requested number of bytes to receive from a stream socket was 0.

#### 4.To change the CC Algorithm -

Copy a string -

#### char \*strcpy(char \*dest, const char \*src);

The strcpy() function copies the string pointed to by src, including the terminating null byte ('\0'), to the buffer pointed to by dest. The strings may not overlap, and the destination string dest must be large enough to receive the copy.

The strcpy() functions return a pointer to the destination string dest.

Calculate the length of a string -

#### size\_t strlen(const char \*s);

The strlen() function calculates the length of the string pointed to by s, excluding the terminating null byte (' $\0$ '). The strlen() function returns the number of bytes in the string pointed to by s.

Set options on sockets -

int setsockopt(int sockfd, int level, int optname, const void \*optval,

socklen\_t optlen);

setsockopt() manipulate options for the socket referred to by the file descriptor sockfd. Options may exist at multiple protocol levels. When manipulating socket options, the level at which the option resides, and the name of the option must be specified. To manipulate options at the sockets API level, level is specified as SOL\_SOCKET. To manipulate options at any other level the proto-col number of the appropriate protocol controlling the option is supplied.

The arguments optval and optlen are used to access option values.

The argument should be nonzero to enable a boolean option, or zero if the option is to be disabled.

On success, zero is returned for the standard options. On error, -1 is returned, and errno is set appropriately.

#### 5.To Close the TCP connection we used the following functions:

 Close a file descriptorclose() closes a file descriptor, so that it no longer refers to any file and may be reused.

#### Receiver function:

- 1. to Create a TCP Connection between the sender and receiver we used the following functions:
  - Create an endpoint for communicationint socket(int domain, int type, int protocol); (see the explanation above)
  - Set options on sockets int setsockopt(int sockfd, int level, int optname, const void
     \*optval,

socklen\_t optlen);

(see the explanation above)

appropriately.

- Fill memory with a constant bytevoid \*memset(void \*s, int c, size\_t n); (see the explanation above)
- Convert values between host and network byte orderuint16\_t htons(uint16\_t hostshort);
   (see the explanation above)
- Bind a name to a socket -When a socket is created with socket(), it exists in a name space (address family) but has no address assigned to it. bind() assigns the address specified by addr to the socket referred to by the file descriptor sockfd. addrlen specifies the size, in bytes, of the address structure pointed to by addr. Traditionally, this operation is called "assigning a name to a socket". It is normally necessary to assign a local address using bind() before a SOCK\_STREAM socket may receive connections. On success, zero is returned. On error, -1 is returned, and errno is set
- Listen for connections on a socket int listen(int sockfd, int backlog);
   listen() marks the socket referred to by sockfd as a passive socket, that is,
   as a socket that will be used to accept incoming connection requests using
   accept().

The sockfd argument is a file descriptor that refers to a socket of type SOCK STREAM or SOCK SEQPACKET.

The backlog argument defines the maximum length to which the queue of pending connections for sockfd may grow.

If a connection request arrives when the queue is full, the client may receive an error with an indication of ECONNREFUSED or, if the underlying protocol supports retransmission, the request may be ignored so that a later reattempt at connection succeeds.

On success, zero is returned. On error, -1 is returned, and errno is set appropriately.

#### 2.To get a connection from the sender we used the following functions:

accept a connection on a socket

int accept(int sockfd, struct sockaddr \*addr, socklen\_t \*addrlen);
The accept() system call is used with connection-based socket types
(SOCK\_STREAM, SOCK\_SEQPACKET). It extracts the first connection
request on the queue of pending connections for the listening socket,
sockfd, creates a new connected socket, and returns a new file descriptor
referring to that socket. The newly created socket is not in the listening
state. The original socket sockfd is unaffected by this call.

The argument sockfd is a socket that has been created with socket(), bound to a local address with bind(), and is listening for connections after a listen().

The argument addr is a pointer to a sockaddr structure. This structure is filled in with the address of the peer socket, as known to the communications layer. The exact format of the address returned addr is determined by the socket's address family. When addr is NULL, nothing is filled in; in this case, addrlen is not used, and should also be NULL.

The addrlen argument is a value-result argument: the caller must initialize it to contain the size (in bytes) of the structure pointed to by addr; on return it will contain the actual size of the peer address.

The returned address is truncated if the buffer provided is too small; in this case, addrlen will return a value greater than was supplied to the call. If no pending connections are present on the queue, and the socket is not marked as nonblocking, accept() blocks the caller until a connection is

present. If the socket is marked nonblocking and no pending connections arenpresent on the queue, accept() fails with the error EAGAIN or EWOULDBLOCK.

- 3. To receive the first and the second part of the file we used the following functions:
  - Receive a message from a socket ssize\_t recv(int sockfd, void \*buf, size\_t len, int flags);
- 4. To measure the time, it took to receive the first and the second part we used the following functions:
  - Get time int gettimeofday(struct timeval \*tv, struct timezone \*tz);
     The functions gettimeofday() can set the time as well as a timezone.
- 5. To send back the authentication to the sender we used the following functions:
  - Send a message on a socketssize\_t send(int sockfd, const void \*buf, size\_t len, int flags);
- 6. To change the CC Algorithm we used the following functions:
  - Copy a string char \*strcpy(char \*dest, const char \*src);
     (see the explanation above)
  - Calculate the length of a string size\_t strlen(const char \*s);
     (see the explanation above)

(see the explanation above)

# 4.To Close the TCP connection we used the following functions:

• Close a file descriptor-

#### int close(int fd);

close() closes a file descriptor, so that it no longer refers to any file and may be reused.

#### 1.2.5 Interfaces

- stdio.h is the header file for the standard input/output library in C. It provides functions for reading from and writing to the standard input and output streams (e.g., printf and scanf).
  - In this project: Used for printing process steps and output information.
- stdlib.h is the header file for the standard library in C. It provides functions for performing general-purpose tasks (e.g., malloc, free, and exit).
   In this project: Used for handling buffers etc.
- sys/socket.h is the header file for the socket interface in C. It provides functions for creating and manipulating sockets (e.g., socket, bind, listen, and accept).
  - In this project: Used for handling sockets and connections.
- arpa/inet.h is the header file for the internet address manipulation library in C. It provides functions for converting internet addresses between their binary and text representations (e.g., inet\_aton and inet\_ntoa).
   In this project: Used for converting IP from binary to text form.
- netinet/in.h is the header file for the internet address family in C. It provides definitions for internet-related data types, such as struct sockaddr\_in which is used to represent internet addresses.
   In this project: Used for initializing socket data using sockaddr\_in struct.
- netinet/tcp.h is the header file for the TCP (Transmission Control Protocol) implementation in C. It provides definitions for TCP-related data types and constants, such as TCP\_NODELAY which disables the Nagle algorithm for reducing the number of small packets sent over the network.
- string.h is the header file for the string library in C. It provides functions for manipulating strings (e.g., strlen, strcpy, and strcmp).

In this project: Used for setting up CC algorithms variables for the setsockopt() function and more, determining string lengths and more.

- errno.h is the header file for the global errno variable in C. errno is set by various functions to indicate an error, and the errno.h header provides definitions for the different possible values of `.
   In this project: Used for specifying the error tha may have occurred and terminated the program.
- The time.h: provides functions for manipulating time values. It includes
  definitions for the time\_t data type, which represents a calendar time, as
  well as functions for converting between time\_t values and strings (e.g.,
  ctime and asctime). It also provides functions for measuring the time
  elapsed between two points in time (e.g., clock and difftime).
  In this project: Used for calculating sending times using gettimeofday()
  func.

# 2 Research findings

# 2.1 Wireshark

# 2.1.1 0% lost

# Sending number 1:

Γ		e.eeeeeeee e.eeee31761	127.0.0.1	127.0.0.1	TCP		55680 + 55680 (5/N) Seq-0 Win-65495 Len-0 MSS-65495 SACK_PERM TSval-3200971646 TSecr-0 WS-128  5680 + 55680 (5/N), ACK) Seq-0 Ack-1 Win-65483 Len-0 MSS-65495 SACK PERM TSval-3200971646 TSecr-3200971646 WS-128
		0.000055623	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-1 Ack-1 Min-65536 Len-0 TSvol-3200971647 TSecr-3200971646
		0.000354152	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-1 Ack-1 Win-65536 Len-4 TSval-3200971647 TSecr-3200971646
	5	0.000371484	127.0.0.1	127.0.0.1	TCP	66	5080 + 55680 [ACK] Seq-1 Ack-5 Win-65536 Len-0 TSvsl-3200971647 TSecr-3200971647
İ	6	0.000407437	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [PSH, ACK] Seq-1 Ack+5 Win-65536 Len-4 TSvsl-3200971647 TSecr-3200971647
İ		0.001590818	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-5 Ack+5 Win-65536 Len-0 TSvzl-3200971648 TSecr-3200971647
	8	0.001652053 0.006948912	127.0.0.1	127.0.0.1	TCP	32834 32834	55680 + 5080 [ACK] Seq-5 Ack-5 Win-65536 Len-22768 TSvsl-3200971648 TSecr-2200971647
		0.006924254		127.0.0.1			[TCP Mindow Full] 55680 + 5080 [PSH, ACK] Seq-32773 Ack-5 Min-6536 Len-32768 TSval-3200971653 TSecr-3200971647 [TCP ZeroMindow] 5080 + 55680 [ACK] Seq-5 Ack-65541 Min-0 Len-0 TSval-3200971653 TSecr-3200971648
		0.044906479	127.0.0.1	127.0.0.1	TCP		[TCP Window Update] 5080 + 55680 [ACK] Seq-5 Ack-65541 Win-48512 Len-0 T5val-3200971691 T5ecr-3200971648
	12	0.044924994	127.0.0.1	127.0.0.1	TCP	32834	55680 + 5880 [ACK] Seq-65541 Ack-5 Win-65536 Len-32768 TSval-3280971691 TSecr-3200971691
i	13	0.084950243	127.0.0.1	127.0.0.1	TCP	66	5080 + 55680 [ACK] Seq-5 Ack-98309 Win-15744 Len-0 TSval-3200971731 TSecr-3200971691
İ		0.098063006	127.0.0.1	127.0.0.1	TCP		[TCP Mindow Update] 5888 + 55688 [ACK] Seq-5 Ack-98389 Win-65536 Len-8 TSval-3208971745 TSecr-3208971891
		0.098077427	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-98389 Ack-5 Min-65536 Len-32768 TSvsl-3200971745 TSecr-3200971745
		0.098085053	127.0.0.1	127.0.0.1 127.0.0.1			[TCP Nindow Full] 55680 + 5980 [ACK] Seq-131077 Ack-5 Nin-65536 Len-32768 TSvel-3200971745 TSecr-3200971745 [TCP ZeroNindow] 5880 + 55680 [ACK] Seq-5 Ack-163845 Nin-0 Len-0 TSvel-3200971745 TSecr-3200971745
	18	0.145719924	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] S880 + 55680 [ACK] Seq-5 Ack-163845 Win-48512 Len-0 TSval-3200971792 TSecr-3200971745
		0.145738282	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-163845 Ack-5 Win-65536 Len-32768 TSval-3200971792 TSecr-3200971792
i	20	0.189496296	127.0.0.1	127.0.0.1	TCP	66	5080 + 55680 [ACK] Seq-5 Ack-196613 Win-15744 Len-0 TSval-3200971836 TSecr-3200971792
i	21	0.263230141	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-5 Ack-196613 Win-65536 Len-0 TSval-3200971910 TSecr-3200971792
j	22	0.263248629	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-196613 AcK-5 Win-65536 Len-32768 TSvsl-3200971910 TSecr-3200971910
ļ		0.263443972 0.263476833	127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP		[TCP Window Full] 55680 + 5880 [PSH, ACK] Seq-219381 Ack-5 Win-65536 Len-32768 TSvel-3200971910 TSecr-3200971910
		0.263476833	127.0.0.1	127.0.0.1	TCP		[TCP ZeroHilndow] 5888 + 55688 [ACK] Seq-5 Ack-262149 Win-8 Sizel-200971910 Tsecr-3200971910 [TCP Window Update] 5888 + 55688 [ACK] Seq-5 Ack-262149 Win-48512 Len-8 TSvzl-3200971937 Tsecr-3200971910
		0.290791318	127.0.0.1	127.0.0.1	TCP		55680 + 5080 (ACK) Seq=262149 Ack-5 Win-65526 Len-32768 TSvzl-3200971937 TSecr-3200971937
	27	0.332729245	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-5 Ack-294917 Win-15744 Len-0 TSval-3200971979 TSecr-3200971937
		0.341070868	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-5 Ack-294917 Win-65536 Len-0 TSvel-3200971988 TSecr-3200971937
	29	0.341080440	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-294917 Ack-5 Min-65536 Len-32768 TSval-3200971988 TSecr-3200971988
	30	0.341086480	127.0.0.1	127.0.0.1	TCP		[TCP Mindow Full] S5680 + 5080 [ACK] Seq-327685 Ack-5 Min-55336 Len-32768 TSval-3200971988 TSecr-3200971988
		0.341101988	127.0.0.1	127.0.0.1	TCP		[TCP ZeroNindow] 5888 + 55680 [ACK] Seq-5 Ack=360453 Win+0 Len+0 TSval=2200971988 TSecr=3200971988 [TCP Window Update] 5888 + 55680 [ACK] Seq-5 Ack=360453 Win+48512 Len+0 TSval=3200972226 TSecr=3200971988
		0.380021492	127.0.0.1	127.0.0.1	TCP		[ICP MILHOUN Update] 5888 + 53088 [RLK] 569-5 ACK-360933 MIN-48312 LEN-8 ISV81-32087/2020 ISECT-320897/2988  55680 + 5080 [PSH, ACK] Seq-360453 Ack-5 Min-65536 Len-32768 TSv81-3208972026 TSecr-3208972026
	34	0.418108941	127.0.0.1	127.0.0.1	TCP	66	5080 → 55680 [ACK] Seq-5 Ack-393221 Win-15744 Len-0 TSvsl-3200972065 TSecr-3200972026
i	35	0.437565399	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-5 Ack-293221 Win-65536 Len-0 TSval-3200972084 TSecr-3200972026
i	36	0.437580918	127.0.0.1	127.0.0.1	TCP	32834	55680 + 5080 [ACK] Seq-393221 Ack-5 Win-65536 Len-32768 TSval-3200972084 TSecr-3200972084
ļ		0.437587131 0.437735158	127.0.0.1	127.0.0.1			[TCP Window Full] 55680 + 5880 [PSH, ACK] Seq-425989 Ack-5 Win-65536 Len-32768 TSvsl-3200972084 TSecr-3200972084
		0.437735158	127.0.0.1	127.0.0.1	TCP		[TCP ZeroNindow] 5080 + 55680 [ACK] Seq-5 Ack-458757 Nin-0 Len-0 TSvzl-3200972084 TSecr-3200972084 [TCP Nindow Update] 5080 + 55680 [ACK] Seq-5 Ack-458757 Nin-48512 Len-0 TSvzl-3200972121 TSecr-3200972084
		0.474499493	127.0.0.1	127.0.0.1	TCP		55680 + 5080 (ACK) Seq=458757 Ack-5 Win-65536 Len-32768 TSvzl-3200972121 TSecr-3200972121
	41	0.516821668	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-5 Ack-491525 Win-15744 Len-0 TSvzl-3200972163 TSecr-3200972121
	42	0.543395920	127.0.0.1	127.0.0.1	TCP		[TCP Mindow Update] 5000 + 55600 [ACK] Seq-5 Ack-491525 Min-65536 Len-0 TSvzl-3200972190 TSecr-3200972121
İ	43	0.543409046	127.0.0.1	127.0.0.1	TCP	32834	55680 + 5880 [PSH, ACK] Seq-491525 Ack-5 Win-65536 Len-32768 TSval-3200972190 TSecr-3200972190
İ		0.543412161	127.0.0.1	127.0.0.1	TCP		55680 + 5880 [PSH, ACK] Seq-524293 Ack-5 Win-65536 Len-3970 TSvsl-3200972190 TSecr-3200972190
		0.543422723	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-5 Ack-528263 Win-45952 Len-0 T5val-3200972190 TSecr-3200972190
		0.577164766 0.577216475	127.0.0.1	127.0.0.1	TCP TCP		5880 + 55800 (PSH, ACK) Seq-5 Ack-520263 Min-65536 Len-4 TSvzl-3200972224 TSecr-3200972190  55600 + 5000 (ACK) Seq-520263 Ack-9 Min-65536 Len-32760 TSvzl-3200972224 TSecr-3200972224
	48	0.577278070	127.0.0.1	127.0.0.1	TCP	32834	[TCP Window Full] 55680 + 5080 [PSH, ACK] Seq-561031 Ack-9 Win-65536 Len-32768 TSvol-3200972224 TSecr-3200972224
ŀ							
	50	0.609245949	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-593799 Win=48512 Len=0 TSval=3200972256 TSecr=3200972224
İ		0.609260233	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-593799 Ack-9 Win-65536 Len-32768 TSvel-3200972256 TSecr-3200972256
		0.652648616 0.674278492	127.0.0.1	127.0.0.1	TCP		5880 - 55800 [ACK] Seq-9 Ack-626567 Win-15744 Len-0 TSvzl-2200972299 TSecr-3200972256  [TCP Window Update] 5880 - 55680 [ACK] Seq-9 Ack-626567 Win-65536 Len-0 TSvzl-3200972221 TSecr-3200972256
		0.674278492	127.0.0.1	127.0.0.1	TCP TCP		[ICF MILHOUN Update] 5888 + 53088 [RLK] 589-9 ACK-02036/ MIR-05336 Len-8/15V81-32089/2321 13ecr-32089/2230 55680 + 5888 (PSH, ACK) Seq-626567 Ack-9 Min-65536 Len-32768 TSv81-3208972321 TSecr-3208972321
		0.674298922	127.0.0.1	127.0.0.1	TCP		[TCP Mindow Full] 55688 + 5888 [ACK] Sec-559335 Ack-9 Min-65536 Len-32768 TSvel-3200972331 TSecr-3200972321
l							
		0.707508090	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-692103 Win-48512 Len-0 TSval-3200972354 TSecr-3200972321
		0.707521911	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-692103 Ack-9 Min-65536 Len-32768 TSvsl-3200972354 TSecr-3200972354
		0.755923113	127.0.0.1	127.0.0.1	TCP TCP		5080 + 55680 [ACK] Seq-9 Ack-724871 Win-15744 Len-0 TSval-3200972402 TSecr-3200972354
		0.819586721 0.819601368	127.0.0.1	127.0.0.1	TCP		[TCP Nindow Update] 5080 + 55680 [ACK] Seq-9 Ack-724871 Nin-65536 Len-0 TSvs1-3200972466 TSecr-3200972354  55680 + 5080 [ACK] Seq-724871 Ack-9 Nin-65536 Len-32768 TSvs1-3200972466 TSecr-3200972466
		0.819608440	127.0.0.1	127.0.0.1	TCP		[TCP Mindow Full] 55680 + 5880 [PSH, ACK] Seq-757639 Ack-9 Min-65536 Len-32768 TSval-3208972466 TSecr-3280972466
	64	0.846536525	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] S080 + S5680 [ACK] Seq-9 Ack-790407 Win-48512 Len-0 TSval-3200972493 TSecr-3200972466
		0.846634436	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-790407 Ack-9 Win-65536 Len-32768 TSvel-3200972493 TSecr-3200972493
		0.888816636	127.0.0.1	127.0.0.1	TCP		5080 - 55680 [ACK] Seq-9 Ack-823175 Win-15744 Len-0 TSval-3200972535 TSecr-3200972493  [TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-823175 Win-65536 Len-0 TSval-320097257 TSecr-3200972493
		0.910522284 0.910560530	127.0.0.1	127.0.0.1	TCP		[TCP Window Update] 5080 + 55600 [ACK] Seq-9 Ack-823175 Win-65536 Len-0 TSvsl-3200972557 TSecr-3200972493  55680 + 5080 [PSH, ACK] Seq-823175 Ack-9 Win-65536 Len-32768 TSvsl-3200972557 TSecr-3200972557
		0.910573416	127.0.0.1	127.0.0.1	TCP		TOP Mindow Full) 55680 + 5880 [ACK] Seq-855943 Ack-9 Min-65536 Len-32768 TSvsl-3200972557 TSecr-3200972557
	71	0.942203565	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-088711 Win-48512 Len-0 TSval-3200972589 TSecr-3200972557
İ		0.942216276	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-888711 Ack-9 Min-65536 Len-32768 TSval-3200972589 TSecr-3200972589
		0.986140169	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-9 Ack-921479 Win-15744 Len-0 TSvel-3200972633 TSecr-3200972589
		1.033610043	127.0.0.1	127.0.0.1	TCP TCP		[TCP Nindow Update] 5080 + 55600 [ACK] Seq-9 Ack-921479 Nin-65536 Len-0 TSvsl-3200972600 TSecr-3200972589  55680 + 5080 [ACK] Seq-921479 Ack-9 Nin-65536 Len-32768 TSvsl-3200972600 TSecr-3200972600
		1.033638130	127.0.0.1	127.0.0.1	TCP		S5688 + 5088 (ACK) Seq-9/214/9 ACK-9 WIN-65536 Len-32/08   S5821-32009/2080   S5627-32009/2080   S5627-320
		1.033652721					[TCP Zeroklindow] 5080 + 55680 (ACK) Seq=9 Ack-987015 Win-0 Len=0 TSvzl=3200972680 TSecr=3200972680
		1.076762971	127.0.0.1	127.0.0.1	TCP		[TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-987015 Win-48512 Len-0 TSval-3200972723 TSecr-3200972680
	79	1.076778900	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [ACK] Seq-987015 Ack+9 Win-65536 Len-32768 TSvzl-3200972723 TSecr-3200972723
		1.119089242	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-9 Ack-1019783 Min-15744 Len-0 TSval-3200972766 TSecr-3200972723
		1.135706352	127.0.0.1	127.0.0.1	TCP		[TCP Window Update] 5080 + 55680 [ACK] Seq-9 Ack-1019783 Win-65536 Len-0 TSval-3200972782 TSecr-3200972723
		1.135791564	127.0.0.1	127.0.0.1	TCP		55680 + 5080 [PSH, ACK] Seq-1039783 Ack-9 Win-65536 Len-32768 TSvsl-3200972782 TSecr-3200972782  55680 + 5080 [PSH, ACK] Seq-1052551 Ack-9 Win-65536 Len-3970 TSvsl-3200972782 TSecr-3200972782
		1.135/9/034	127.0.0.1	127.0.0.1	TCP		5080 + 55680 [ACK] Seq-9 Ack-1056521 MIn-45952 Len-0 TSval-3200972782 TSecr-3200972782
		4.425240221	127.0.0.1	127.0.0.1	TCP	70	*55880 - 5880 TPSH, ALK  586-1058511 AEK-9 NIA-5550 LBH-4 TSVEL-3200978071 TSECH-3200972702

# Sending number 5:

325	15.346294917	127.0.0.1	127.0.0.1	TCP	70
326 327	15.346307723 15.346361129	127.0.0.1	127.0.0.1	TCP TCP	
327	15.346361129	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [ACK] Seq=4226085 Ack=21 Nin=65536 Len=32768 T5vzl=3200986993 T5ecr=3200986993 66 5080 + 55680 [ACK] Seq=21 Ack=4258853 Nin=48512 Len=8 T5vzl=3200986993 T5ecr=3200986993
329	15.346533884	127.0.0.1	127.0.0.1	TCP	2824 SS68 - S889 (FSH, ACK) SECULOR STATE (MINESTEE CONTROL OF STATE OF STA
330	15.388729578	127.0.0.1	127.0.0.1	TCP	66 5080 + 5560 (ACK) Sec. J Ack-42015/1 Min-15744 Lenne TSvel-3200987035 TSec-3200986993
331	15.426547008	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-21 Ack-4291621 Win-65536 Len-0 T5val-3200987073 T5ecr-3200986993
332	15.426561834	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [ACK] Sec-4291621 Ack-21 Win-65536 Len-32768 TSvzl-3200987073 TSecr-3200987073
333	15.426568749	127.0.0.1	127.0.0.1	TCP	32834 [TCP Mindow Full] 55680 + 5880 [PSH, ACK] Seq-4324389 Ack-21 Min-65536 Len-32768 TSvel-3200987073 TSecr-32009870
					66 [TCP ZeroMindow] 5080 + 55680 [ACK] Seq-21 Ack-4357157 Win-0 Len-0 T5val-3200987073 TSecr-3200987073
335	15.454135864	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Updste] 5080 + 55680 [ACK] Seq-21 Ack-4357157 Win-48512 Len-0 TSvs1-3200987101 TSecr-1200987073
336	15.454150178	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5000 [ACK] Seq-4357157 Ack-21 Win-65536 Len-32768 TSvel-3200987101 TSecr-3200987101
337	15.496707813	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-21 Ack-4389925 Win-15744 Len-0 TSvel-3200987143 TSecr-3200987101
338	15.511123843	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5880 + 55680 [ACK] Seq-21 Ack-4389925 Win-65536 Len-0 TSval-3200987158 TSecr-3200987101
339	15.511137638	127.0.0.1	127.0.0.1	TCP	32834 55680 - 5880 [PSH, ACK] Seq-4389925 Ack-21 Win-65536 Len-32768 T5val-3200987158 T5ecr-3200987158
340	15.511144926	127.0.0.1	127.0.0.1	TCP	32834 [TCP Window Full] 55688 + 5880 [ACK] Seq=4422693 Ack=21 Win=65536 Len=32768 T5vel=3200987158 T5ecr=3200987158
342	15.540063024	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq=21 Ack=4455461 Win-48512 Len=0 TSval=3200987187 TSecr=3200987158
343	15.540165366	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5880 [PSH, ACK] Seq-4455461 Ack-21 Win-65536 Len-32768 TSval-3200987187 TSecr-3200987187
344	15.580671396	127.0.0.1	127.0.0.1	TCP	66 5880 + 55680 [ACK] Seq-21 Ack-4488229 Win-15744 Len-0 TSvsl-3200987227 TSecr-3200987187
345	15.611393339	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5880 + 55680 [ACK] Seq-21 Ack-4488229 Win-65536 Len-0 TSval-3200987258 TSecr-3200987187
346	15.611439184	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5880 [ACK] Seq=4488229 Ack-21 Win-65536 Len-32768 TSvel-3200987258 TSecr-3200987258
	15.611459924	127.0.0.1	127.0.0.1		22824 [TCP Mindow Full] 55688 + 5888 [PSH, ACK] Seq-4528997 Ack-21 Min-65536 Len-22768 TSvs1-2288987258 TSecr-22889872
348 349	15.611503294 15.645791302	127.0.0.1	127.0.0.1	TCP	66 [TCP Zeroklindow] 5880 + 55680 [ACK] Seq=21 Ack=4553765 Win=0 Len=0 T5vsl=3200987298 T5ecr=3200987258 66 [TCP Mindow Update] 5980 + 55680 [ACK] Seq=21 Ack=4553765 Win=48512 Len=0 T5vsl=3200987292 T5ecr=3200987258
349 350	15.645791302 15.645806317	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-21 Ack-4553765 Win-48512 Len-0 TSval-3200987292 TSecr-3200987258 32834 55680 + 5080 [ACK] Seq-4553765 Ack-21 Win-65536 Len-32768 TSval-3200987292 TSecr-3200987292
350	15.689397929	127.0.0.1	127.0.0.1	TCP	3834 3000 + 3000 [M.K] 3000   3000
352	15.706940028	127.0.0.1	127.0.0.1	TCP	66 [TCP Nindow Update] 5080 + 55680 [ACK] Seq-21 Ack-4586333 Nin-65536 Len-0 TSval-3200987353 TSecr-3200987292
353	15.706954075	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [PSH, ACK] Seq-4586533 Ack-21 Win-65536 Len-32768 TSval-2200987353 Tsecr-3200987353
354	15.706961837	127.0.0.1	127.0.0.1	TCP	31824 [TCP Window Full] 55680 + 5880 [ACK] Seq-4519301 Ack-21 Win-65536 Len-22768 TSvzl-3200987353 TSecr-3200987353
					66 [TCP ZeroWindow] 5880 - 55680 [ACK] 5eq-21 Ack-4652060 Win-0 Len-0 TSval-3200087353 TSecr-3200987353
356	15.733053225	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-21 Ack-4652869 Win-48512 Len-0 TSvsl-3280987379 TSecr-3280987353
357	15.733070148	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [PSH, ACK] Seq-4652069 Ack-21 Win-65536 Len-32768 TSvsl-3200987380 TSecr-3200987379
358	15.776722535	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-21 Ack-4684837 Win-15744 Len-0 TSvel-3200987423 TSecr-3200987380
359	15.784746864	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] S080 - 55680 [ACK] Seq-21 Ack-4684837 Win-65536 Len-0 TSval-3200987431 TSecr-3200987380
360	15.784823668	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5880 [ACK] Seq-4684837 Ack-21 Win-65536 Len-32768 TSvel-3200987431 TSecr-3200987431
361	15.784832419	127.0.0.1	127.0.0.1	TCP	32834 [TCP Window Full] 55680 + 5880 [PSH, ACK] Seq-4717605 Ack-21 Win-65536 Len-32768 TSvel-3200987431 TSecr-3200987
					66 [TCP ZeroWindow] 5080 + 55680 [ACK] Seq=21 Ack=4750373 Win=0 Len=0 T5vsl=3200987431 TSecr=3200987431
363	15.810999384	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5000 + 55600 [ACK] Seq-21 Ack-4750373 Win-48512 Len-0 TSval-3200987457 TSecr-3200987431
364	15.811010113	127.0.0.1	127.0.0.1	TCP	4036 55680 + 5080 [PSH, ACK] Seq-4750373 Ack-21 Win-65536 Len-3970 TSval-3200987457 TSecr-3200987457
365	15.840368028	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-21 Ack-4754343 Win-65536 Len-0 TSvel-3200987487 TSecr-3200987457
366	15.840490766	127.0.0.1	127.0.0.1	TCP	70 5880 + 55680 [PSH, ACK] Seq-21 Ack-4754343 Win-65536 Len-4 TSvzl-3200987487 TSecr-3200987457
367	15.840846777	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5880 [ACK] Seq=4754343 Ack=25 Win=65536 Len=32768 TSvel=3200987487 TSecr=3200987487
368 369	15.841008064 15.841229744	127.0.0.1	127.0.0.1 127.0.0.1	TCP	32834 [TCP Mindow Full] 55680 + 5880 [PSH, ACK] Seq=4787111 Ack-25 Min-65536 Len-32768 TSvzl-3200987487 TSecr-32009874 66 [TCP ZeroMindow] 5880 - 55680 [ACK] Seq=25 Ack-4819879 Min-8 Len-8 TSvzl-3200987488 TSecr-3200987487
370	15.841229744	127.0.0.1	127.0.0.1	TCP	66 [TCP ZeroKindow] 5080 + 55680 [ACK] Seq-25 Ack-4819879 Kin-8 Len-8 Tsval-3200987488 Tsecr-3200987487 66 [TCP Kindow Update] 5080 + 55680 [ACK] Seq-25 Ack-4819879 Kin-40512 Len-8 Tsval-3200987526 Tsecr-3200987487
371	15.879446693	127.0.0.1	127.0.0.1	TCP	32834 S5680 + 5880 [ACK] Seq-4819879 Ack-25 Win-65536 Len-32768 T5val-3280987526 T5ecr-3280987526
372	15.920625372	127.0.0.1	127.0.0.1	TCP	66 5880 - 55680 [ALK] Seq-125 Ack-4852647 Win-15744 Len-0 Tsval-1200987507 TSecr-3200987526
373	15.948926781	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 - 55680 [ACK] Seq-25 Ack-4852647 Win-65536 Len-0 TSvel-3200087595 TSecr-3200987526
374	15.948947851	127.0.0.1	127.0.0.1	TCP	32834 55680 - 5080 [PSH, ACK] Seq-4852647 Ack-25 Win-65536 Len-32768 TSval-3200987595 TSecr-3200987595
375	15.948956672	127.0.0.1	127.0.0.1	TCP	32834 [TCP Mindow Full] 55680 + 5880 [ACK] Seq+4885415 Ack-25 Win-65536 Len-32768 T5vel-3200987595 Tsecr-3200987595
					66 [TCP ZeroMindow] 5080 + 55680 [ACK] Seq-25 Ack-4918183 Win-0 Len-0 TSval-3200987595 TSecr-3200987595
377	15.975820368	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55600 [ACK] Seq-25 Ack-4918183 Win-48512 Len-0 TSvsl-3200987622 TSecr-3200987595
378	15.975904875	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [PSH, ACK] Seq-4518183 Ack-25 Min-65536 Len-32768 T5val-3200987622 T5ecr-3200987622
379	16.016636667	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-25 Ack-4950951 Win-15744 Len-0 T5val-3200987663 TSecr-3200987622
380	16.028795160	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-25 Ack-4950951 Win-65536 Len-0 T5val-3200987675 T5ecr-3200987622
381	16.028805884	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-32768 Tsvsl-3200987675 Tsecr-3200987675
382	16.028812315	127.0.0.1	127.0.0.1	TCP	32834 [TCP Window Full] 55680 + 5880 [PSH, ACK] Seq=4983719 Ack=25 Win=65536 Len=32768 T5val=3200987675 T5ecr=3200987
					66 [TCP Zeroklindow] 5080 + 55680 [ACK] Seq-25 Ack-5016487 kin-0 Len-0 Tsvzl-3200987675 Tsecr-3200987675
384	16.053954065	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55600 [ACK] Seq-25 Ack-5016487 Win-48512 Len-0 TSval-3200987700 TSecr-3200987675
	16.053968125	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 TSvzl-3200987700 TSecr-3200987700
386	16.104932003	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-25 Ack+5049255 Win+65536 Len+0 TSval-3200087751 TSecr-3200987700
387	16.104952254	127.0.0.1	127.0.0.1	TCP	32834 55680 + 5080 [PSH, ACK] Seq-5049255 Ack-25 Min-65536 Len-32768 TSval-3200987751 TSecr-3200987751
388	16.104960435	127.0.0.1	127.0.0.1		32834 [TCP Window Full] 55680 + 5800 [ACK] Seq-5082023 Ack-25 Win-65536 Len-32768 T5vel-3200987751 TSecr-3200987751
389	16.104984275	127.0.0.1	127.0.0.1	TCP	66 [TCP Zeroklindow] 5080 + 55680 [ACK] Seq-25 Ack-5114791 Win-0 Len-0 TSval-3200987751 Tsecr-3200987751 66 [TCP Window Update] 5080 + 55680 [ACK] Seq-25 Ack-5114791 Win-18512 Len-0 TSval-3200987784 Tsecr-3200987751
390	16.137932937	127.0.0.1	127.0.0.1	TCP	
391 392	16.137949773 16.178400949	127.0.0.1	127.0.0.1	TCP TCP	32834 55680 + 5080 [PSH, ACK] Seq-5114791 Ack-25 Win-65336 Len-32768 Töval-3200987784 TSecr-3200987784  66 5880 + 55680 FACK] Sep-25 Ack-5147559 Win-15744 Len-0 TSval-3200987815 TSecr-3200987784
392	16.1/8400949	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55600 [ACK] Seq-25 Ack-5147559 Win-65536 Len-0 TSval-3200987/84
393	16.202789574	127.0.0.1	127.0.0.1	TCP	00 [ILP NILHOWN UPDSTE] 3080 + 30800 [ALK] 3eq-25 ACK-314/339 NILH-003360 Len-0 [3v21-320098/849 13ecr-320098/84] 32834 55680 + 5080 [ALK] 5eq-5147559 Ack-25 NILH-65536 Len-32768 TSva1-3200987849 TSecr-3200987849
395	16.202802225	127.0.0.1	127.0.0.1	TCP	32834 (TCP Window Full) 55680 + 5880 (PSH, ACK) Seq-5188327 Ack-25 Win-65536 Len-32768 TSvz1-3200987849 TSecr-3200987
	16.202823524	127.0.0.1	127.0.0.1		[CTC Perceiting   5880 + 55680 [ACK] Seq=25 Ack-5213095 Win-0 Lenn-8 Tsval-1200987849 TSecr-1200987849
397	16.228356937	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-25 Ack-5211095 Win-48512 Len-0 TSvxl-3200897875 TSecr-3200987849
398	16.228370531	127.0.0.1	127.0.0.1	TCP	23834 55688 + 5688 [ACK] Seq-5213095 Ack-25 Win-65536 Len-32768 TSval-3200987875 TSecr-3200987875
	16.266218882	127.0.0.1	127.0.0.1	TCP	66 5880 - 55680 [ACK] Seq-25 Ack-5245863 Win-15744 Len-0 T5vel-3200987913 TSecr-3200987875
400	16.292296795	127.0.0.1	127.0.0.1	TCP	66 [TCP Window Update] 5080 + 55680 [ACK] Seq-25 Ack-5245863 Win-65536 Len-0 T5vel-3200987939 TSecr-3200987875
401	16.292329518	127.0.0.1	127.0.0.1	TCP	22834 55680 → 5880 [PSH, ACK] Seq-5245863 Ack-25 Min-65536 Len-32768 TSvsl-3200987939 TSecr-3200987939
402	16.292332577	127.0.0.1	127.0.0.1	TCP	4036 55680 + 5080 [PSH, ACK] Seq-5278631 Ack-25 Min-65536 Len-3970 TSval-3200987939 Tsecr-3200987939
403	16.292457361	127.0.0.1	127.0.0.1	TCP	66 5080 - 55600 [ACK] Seq-25 Ack-5282601 Win-45952 Len-0 TSval-3200987939 TSecr-3200987939
484	21.866609782	127.0.0.1	127.0.0.1	TCP	70 55680 → 5000 [PSH, ACK] Seq-5282601 Ack-25 Nin=65536 Len-4 T5val-3200993513 T5ecr-3200987939
405	21.866621551	127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [ACK] Seq-25 Ack-5282605 Win-64896 Len-0 T5vsl-3200993513 TSecr-3200993513
496	21.866641697	127.0.0.1	127.0.0.1	TCP	66 S5680 + 5080 [FIM, ACK] Seq-5282605 Ack-25 Win-65536 Len-0 TSvel-3200993513 TSecr-3200993513
		127.0.0.1	127.0.0.1	TCP	66 5080 + 55680 [FIN, ACK] Seq-25 Ack-5282606 Win-65536 Len-0 TSvel-3200993514 TSecr-3200993513
407	21.867339480	127.0.0.1	127.0.0.1	ICF	500 - 55000 [1.11, Ack] 354-25 Ack-520200 H211-05550 Ecit-0 15102-520055552

55

#### Zoom in:

Open connection in line 1, 2.

```
74 55680 → 5080 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK_PERM TSval=3200971646 TSecr=0 WS=128

74 5080 → 55680 [SYN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TSval=3200971646 TSecr=3200971646 WS=128
```

The "[TCP Window Full]" message from Wireshark means that the system sending this TCP segment has filled up the receive window of the other end with the tcp segment in this packet. Or put differently: the last received window size of the other end is equal to the length of the TCP segment in this packet

Zero Window means that the receiver of the packets waves a "white flag" towards the sender, telling it to stop sending because there is no more buffer space for incoming packets. This is in almost all cases a sign of the receiver being too slow to process the incoming packets in time.

A packet marked "TCP Window Update" simply **indicates that the sender's TCP receive buffer space has increased**. Look at the previous packet from the sender note the Window Size value in the TCP header.

```
32834 [TCP Window Full] 55680 → 5080 [PSH, ACK] Seq=32773 Ack=5 Win=65536 Len=32768 TSval=3200971653 TSecr=3200971647
66 [TCP ZeroWindow] 5080 → 55680 [ACK] Seq=5 Ack=65541 Win=0 Len=0 TSval=3200971653 TSecr=3200971648
66 [TCP Window Update] 5080 → 55680 [ACK] Seq=5 Ack=65541 Win=48512 Len=0 TSval=3200971691 TSecr=3200971648
```

Checking for authentication in line 46, we can see that the receiver sent it after he get the first half of the file, and that the packet length of the is 4 (int)

```
70 5080 → 55680 [PSH, ACK] Seq=5 Ack=528263 Win=65536 Len=4 TSval=3200972224 TSecr=3200972190
```

close the socket 406, 407, 408

```
66 55680 → 5080 [FIN, ACK] Seq=5282605 Ack=25 Win=65536 Len=0 TSval=3200993513 TSecr=3200993513
66 5080 → 55680 [FIN, ACK] Seq=25 Ack=5282606 Win=65536 Len=0 TSval=3200993514 TSecr=3200993513
66 55680 → 5080 [ACK] Seq=5282606 Ack=26 Win=65536 Len=0 TSval=3200993514 TSecr=3200993514
```

## 2.1.2 10% lost

# Sending number 1:

1 2	0.000000000	127.0.0.1	127.0.0.1	TCP	74	24154 - 5080 (578) Sec-0 Non-55405 Len-0 MSS-55405 SACE_PERM TSN21-2000144510 TSec-0 NS-110  5080 - 24154 (578) ACK) Sec-0 Ack-1 Non-55405 Len-0 MSS-65405 SACE PERM TSN21-2001146510 TSec-2001146510 NS-120
,	0.000016115	127.0.0.1	127.0.0.1	TCP		34154 + 5000 (ACK) Sec-1 Ack-1 Min-65336 Lan-8 TSvel-2301146519 TSecr-2301146519
4	0.000051491	127.0.0.1	127.0.0.1	TCP	78	24154 - 5888 (PSH, ACK) Seq-1 Ack-1 Nin-65536 Len-4 TSval-2281148519 TSecr-2281148519
	0.000067162	127.0.0.1	127.0.0.1	TCP	66	5000 - 34154 [ACK] Seq-1 Ack-5 Nin-55536 Len-8 TSvs1-200140519 TSecr-200140519
6	0.000471975	127.0.0.1	127.0.0.1	TCP	70	5000 - 24154 [PSH, ACK] Seq-1 Ack-5 Nin-65536 Len-4 TSvs1-2201148519 TSecn-2201148519
7	0.000479262	127.0.0.1	127.0.0.1	TCP	66	34154 - 5868 [ACK] Seq-5 Ack-5 Nin-65536 Len-8 T5vsl-2201148520 T5ecr-2201148519
•	0.000975902	127.0.0.1	127.0.0.1	TCP	32834	34154 - 5000 (ACK) Seq-5 Ack-5 Nin-65536 Len-22760 TSvs1-3201146520 TSecr-2201146510
9	0.027700536	127.0.0.1	127.0.0.1	TCP	66	5000 - 24154 (ACK) Seq.5 Act-23773 Nin-65556 Len-8 TSvn1-220114557 TSecr-2201145508 [TIC Nincou Full] [TIC Previous segment not costures] 20154 - 1500 [ACK] Sec-55541 Ack-5 Nin-65536 Len-23766 TSvn1-230114547 TSecr-220114547
11	0.027735921	127.0.0.1	127.0.0.1		78	[TCP Dup ACK 991] 5000 - 34154 [ACK] Sep-5 Ack-12773 Nin-65530 Len-9 Ts/s1-120144547 TSep120144538 SLC-65541 SEC-93309
12						[TCP Out-Of-Order] 34154 = 5000 [PSH, ACK] Seq-22772 Ack-5 Nin-65526 Len-22766 TSval-2201146547 TSecr-2201146547
13	0.055495039	127.0.0.1	127.0.0.1	TCP	66	5000 + 34154 (ACK) Seq-5 Ack-98309 Nin-48512 Len-8 TSvs1-2201148575 TSecr-2201148547
14	0.056516556	127.0.0.1	127.0.0.1	TCP	32824	24154 - 5000 [PSH, ACK] Seq-90209 Ack-5 Nin-65526 Len-22768 TSHsl-2201148576 TSecr-2201148576
15	0.102201294	127.0.0.1	127.0.0.1	TCP	66	5000 + 34154 [ACK] Seq-5 Ack-131877 Nin-65536 Len-0 TSvs1-3301148532 TSecr-2301146576
16	0.102201727	127.0.0.1	127.0.0.1	TCP	32824	14154 - 1888 (ACK) Sag-131877 Adx-5 Nin-65536 Lan-12768 TSvn1-3381144612 TSag-7-1881144612 [TGP Ningow Full] 14154 - 1888 [TSV, ACK] Sag-181845 Adx-5 Nin-65536 Lan-12768 TSvn1-3281146612 TSag-72821144612
17	0.103310325		127.8.8.1		52624	[TCF Nincon Full] 34154 + 5888 [PS4, ACK] Seq-163845 Ack-5 Nin-65536 Lea-22768 TSvel-120144612 TSecr-220144612 [TCF Zerokindow] 5888 - 34154 [ACK] Seq-5 Ack-186813 Nin-8 Lea-8 TSvel-120144612 TSecr-220144612
19	0.139799966	127.0.0.1	127.0.0.1	TCP	66	[TCF Window Update] 2000 - 24154 [ACK] Sec-5 Ack-106612 Win-45112 Len-8 T5val-2201148659 T5ecr-2201148622
20	0.359154015	127.0.0.1	127.0.0.1	TCP	32934	34154 - 5060 (ACK) Seq-196613 Ack-5 Nin-65536 Len-32766 TSvs1-320146679 TSecr-220146659
21	0.359221931	127.0.0.1	127.0.0.1	TCP	65	5000 - 34154 (ACK) Seq-5 Ack-220001 Nin-46512 Len-0 TSval-2201140070
22	0.509005360	127.0.0.1	127.0.0.1	TCP	22024	24154 - 5000 [PSH, ACK] Seq-200001 Ack-5 Min-65536 Lan-22760 TSval-2001140100 TSecr-2001146070
22	0.589424510	127.0.0.1	127.0.0.1	TCP	66	5888 + 34154 (ACK) Seq-5 Ack-262149 Nin-46512 Len-8 TSvs1-2201149188 TSecr-2201149188
24 25	0.589461683	127.0.0.1	127.0.0.1	TCP TCP	32824	24154 - 5000 (ACK) Seq-20169 Ack-5 Nin-65130 Len-21760 T5vs1-210149100 TSecr-210149100  5000 - 24154 (ACK) Sec-5 Ack-204017 Nin-15744 Len-0 T5vs1-2101149150 TSecr-2101149100
25	0.640194961	127.0.0.1	127.0.0.1	TCP	15418	5880 + 34154 (ACC) SEC-5 ACC-294017 NUM-15744 LEN-8 TSYSI-2201149159 TSECT-2201149108  [TCF NUMCON Full] 34154 + 5800 [FS4, ACC] Sec-244017 Acc-5 NUM-65105 LEN-15744 TSysi-2101149279 TSECT-2201149159
27	0.860427727	127.0.0.1	127.0.0.1	TCP	66	5880 = 24154 [ACK] Seq-5 Ack-210651 Nin-57888 Len-8 TSvs1-2381142279 TSecr-2281149279
28	0.860477785	127.0.0.1	127.0.0.1	TCP	17090	34154 - 5000 [PSH, ACK] Sec-310051 Ack-5 Nin-05536 Len-17024 TSH01-2201149279 TSecr-2201149279
29	0.960495766	127.0.0.1	127.0.0.1	TCP	22824	24154 - 5000 [ACK] Seq-327665 Ack-5 Nin-65536 Len-22766 TSvs1-220140379 TSecr-2201140379
20	0.850815240	127.0.0.1	127.0.0.1	TCP	65	5000 - 34154 (ACK) Seq-5 Ack-360453 Nin-7306 Len-0 TSvs1-3201149300 TSecr-3201149379
21	0.920621331	127.0.0.1	127.0.0.1	TCP	66	[TCP Mindow Update] 5000 = 24154 [ACK] Seq-5 Ack-200452 Min-65536 Len-0 T5vs1-2201149440 T5ecr-2201149279
22	0.920835563	127.0.0.1	127.0.0.1	TCP	12014	24154 - 5000 (PSH, ACK) Sap-260453 Ack-5 Win-65536 Lan-22766 TSvn1-2201149440 TSacr-2201149440  TTC Windows 50101 24154 - 5000 76X11 Sap-200118 Ack-5 Win-55536 Lan-21766 TSun1-2101149440 TSacr-2101149440
24	0.921125162	127.0.0.1	127.0.0.1			[TCF Zerollindow] 5000 = 24154 [ACC] Seq.5 Ack-415000 Nim-8 Len-8 TS/w1-2201149440 TSecr-2201149440
25	0.951570245	127.0.0.1	127.0.0.1	TCP	66	[TCP Mindow Update] 5000 = 24154 [ACK] Sec-5 Ack-425000 Min-48212 Len-8 T5wal-2201149401 T5ecr-220114940
26	0.961709343	127.0.0.1	127.0.0.1	TCP	32834	34154 - 5000 [PSH, ACK] Seq-425009 Ack-5 Min-65536 Len-22760 TSvel-2201149401 TSecr-2201149401
27	1.009409426	127.0.0.1	127.0.0.1	TCP	66	5868 + 24154 [ACK] Seq-5 Ack-458757 Nin-65536 Len-8 TSvs1-2281149527 TSecn-2281149481
36	1.008425889	127.0.0.1	127.0.0.1	TEP	32834	[TCP Mindow Full] [TCP Previous segment not ceptured] 34154 = 5000 [PSH, ACK] Seq-401525 Ack-5 Min-55206 Len-22760 TSval-220149227 TSecr-2201149227
29	1.005421530	127.0.0.1				[TCF Dup ACK 2781] 5000 - 34154 [ACK] Seq.5 Ack-450757 Min-65536 Len-8 TSval-200140527 TSecr-2100140461 SLE-401525 SEC-514100
40	1.000709100	127.0.0.1	127.0.0.1			[TCP Setromonistics] 34154 = 5888 (ACK) Sec-458757 Ack-5 Win-65556 Len-12765 Threl-2202149518 TSecr-2202149527 [TCP ZeroWincom) 5888 = 34154 (ACK) Sec-5 Ack-124022 Win-6 Len-8 T5ws1-2202149518 TSecr-2202149518
42	1.225116266	127.0.0.1	127.0.0.1	TCP		[TCF (mac-Alive] 34154 + 5000 [ACK] Sec-514202 Ack-5 Win-65536 Len-0 TSval-2301140744 TSecr-2301140538
43	1.225163877	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5000 = 24154 [ACK] Seq-5 Ack-524200 Win-65526 Len-8 TSvs1-2201149744 TSscn-2201149528
44	1.225182146	127.0.0.1	127.0.0.1	TCP	4236	34154 - 5000 (PSH, ACK) Sec-524203 Ack-5 Min-65536 Len-2070 TSH21-3201140744 TSecr-3201140744
45	1.225325368	127.0.0.1	127.0.0.1	TCP	66	5888 - 34154 (ACK) Seq-5 Ack-518283 Non-61976 Len-8 TSys1-3281149744 TSecr-3281149744
46	1.136765695	127.0.0.1	127.0.0.1	TCP	70	5000 - 24154 (PSH, ACK) Seq-5 Ack-530263 Win-5536 Len-4 TSval-2201149750 TSecr-2201149744
47	1.220145080	127.0.0.1	127.0.0.1	TCP	12824	24154 - 1888 (ACK) Sag-152163 Adx-0 Nin-65556 Lam-22768 TSvn1-2301149756 TSagr-2201149756 [TCP Nindow F011] 24154 - 1888 [FSN, ACK] Sag-55101 Adx-0 Nin-65556 Lam-22768 TSvn1-2201149756 TSagr-2201149758
49	1.241897895	127.0.0.1	127.0.0.1		22824	[TCP Namesh Full] 24154 - 5000 [FSA, ACK] 540-511011 ACC-9 MIN-05120 LAN-21708 T3V41-120114V758 T3ACC-220114V758  [TCP ZaroMindow] 5000 - 94154 [ACK] 540-9 Acc-527079 Nin-0 Lan-0 T5V41-2201149761 T5acc-2201149759
50	1.300143534	127.0.0.1	127.0.0.1	TCP	66	[TCP Nindow Update] 5000 = 34154 [ACK] Seq-9 Ack-503799 Nin-48512 Len-8 T5val-2201140019 T5ecr-2201149758
51	1.512269327	127.0.0.1	127.0.0.1	TCP	32934	34154 - 5000 [ACK] Seq-592799 Ack-9 Nin-65536 Len-22768 TS:x1-2301150031 TSecr-2301140019
52	1.512240127	127.0.0.1	127.0.0.1	TCP	66	5000 - 24154 [ACK] Seq-9 Arc-526567 Nin-46512 Len-0 TSvs1-2201150021 TSecr-2201150021
53	1.512351696	127.0.0.1	127.0.0.1	TCP	32824	34154 - 5000 [PSH, ACK] Sec-636567 Ack-9 Min-65536 Len-22768 TSval-2201150001 TSecr-2201150001
54	1.585589424	127.0.0.1	127.0.0.1	TCP	66	5000 - 34124 (ACK) Sag-0 Art-659215 Nin-12744 Lan-8 Towal-2001150055 Tierr-2101150021 [TGP Ningons Foll] 34124 - 5000 [Div. ACK] Sag-659215 Act-0 Nin-65536 Lan-13744 Towal-2101150211 Tierr-2101150085
55	1.791845385	127.0.0.1	127.0.0.1	TCP	15810	[10 NITCON FOIL] ARIA 4 SHEE [FOR, KCK] SHE-COSES KEON KEN-COSES CHR-10/A4 (SVE-LEGISSEZ) (SHEY-ZEGISSEZ)  500 4 24154 (ACK) SHI-9 Ack-075770 KEN-57000 LHN-0 TSVH-1301150311 TSHEY-3101150311
57	1.791690357	127.0.0.1	127.0.0.1	тся	17898	24154 - 5888 (PSH, ACK) Sec-675879 Ack-9 Win-65536 Len-17824 TSval-2281158211 TSecr-2281158211
58	1.791708973	127.0.0.1	127.0.0.1	TCP	32824	24154 - 5000 [PSH, ACK] Seq-602103 Ack-0 Min-65536 Len-22768 TSval-2301150311 TSecr-2202150311
59	1.792683853	127.0.0.1	127.0.0.1	TCP	66	5860 ± 34154 [ACK] Seq-9 Ack-734671 Min-7365 Len-8 TSvs1-2201150212 TSecr-2201150211
60	1.855253248	127.0.0.1	127.0.0.1	TCP	66	[TCP Nindow Update] 5888 = 34154 [ACK] Seq-9 Ack-724871 Nin-65536 Len-8 TSvel-3281158775 TSecr-2281158711
61	1.656859478	127.0.0.1	127.0.0.1	TCP	22024	24154 - 5000 (ACK) Sag-724571 Ack-0 Nin-65556 tam-21766 TSvs1-1201150275 TSear1201150275  [TGP Ninscon Full] 24154 - 5000 [Sin, ACK] Sag-727639 Ack-0 Nin-65556 tam-22766 TSvs1-1201150275 TSear2201150275
62 63	1.956964142	127.0.0.1	127.0.0.1		22424 66	[TCP Nameous Full] 34154 + 1888 [PSH, ACM] Sec-737039 Act-9 Nam-65336 Len-22706 TSval-2380138275 TSec-2380138275 [TCP Tarchingow] 5800 + 34154 [ACM] Sec-9 Act-780487 Nim-8 Len-8 TSval-2380138276 TSec-2380138275
64	2.072364692	127.0.0.1	127.0.0.1	TCP	66	[TCP Keep-Alive] 24154 + 5850 [ACK] Sep-700486 Ack-0 Nin-65556 Len-8 TSvel-2201150501 TSecr-2201150276
65	2.072423647	127.0.0.1	127.0.0.1	TCP	66	[TCP Nindow Update] 5000 = 34154 [ACK] Seq-9 Ack-700407 Nin-65536 Len-8 TSvel-2001150591 TSecr-2001150375
66	2.072450294	127.0.0.1	127.0.0.1	TCP	22824	24154 - 5888 [ACK] Seq-700487 Ack-9 Nin-65536 Len-22769 TSvsl-2201158591 TSecr-2201158591
67	2.072471536	127.0.0.1	127.0.0.1	TCP	32834	[TCF Window Full] 34154 + 5800 [PSH, ACX] Sec-812175 Act-9 Win-65536 Len-22768 TSwal-2121158591 TSecr-2201158591
66	2.072515427	127.0.0.1	127.0.0.1	TCP	66	5860 - 34154 [ACK] Seq-9 Act-822175 Nin-46512 Len-8 T5vs1-2201150592 TSecr-2201150591
69 78	2.126542020	127.0.0.1	127.0.0.1	TCP	66	5000 + 34154 (ACK) Seq-0 Act-055943 Nin-46512 Len-0 Town1-1201150546 Their-2201150591  24154 - 1000 FACT Sequence Arto Nin-87506 Len-23762 Town1-3201150666 Their-2201150666
78	2.165727257	127.0.0.1	127.0.0.1	TCP	11914	34154 - 5000 (ACK) 380-833943 ACK-9 NUM-5330 Lam-32700 T3NS1-3201138040 T38C7-3201138040 5500 - 34154 (ACK) 580-9 Ack-888711 Num-5530 Lam-8 T5NS1-3201138055 T58C7-3201138546
72	2.165856892	127.0.0.1	127.0.0.1	тср	12824	24154 - 5000 (PSH, ACK) Seq-600711 Ack-9 Min-65500 Len-21760 TSvel-2201150005 TSecr-2201150005
73	2.165864524	127.0.0.1	127.0.0.1	TCP	22824	[TCP Mindow Full] 34154 - 5002 [ACK] Seq-921479 Ack-9 Min-65536 Len-92768 TSval-2001150655 TSecr-2001150655
74						[TCP ZeroKindow] 5888 - 34154 [ACK] Seq-9 Ack-954247 Kin-8 Len-8 TSvs1-2201158585 TSecr-2201158585
75	2.200021375	127.0.0.1	127.0.0.1	TCP	66	[TCP Nindow Update] 5000 = 34154 [ACK] Seq-9 Ack-954247 Nin-48512 Len-8 TSvel-2201150719 TSecr-2201150085
	2.200041855	127.0.0.1	127.0.0.1	TCP	22924	24154 - 5888 [95W, ACK] Seq-954247 Ack-9 Min-55536 Len-22768 TSval-2282158719 TSecr-2282158719
77 78	2.239767215	127.0.0.1	127.0.0.1	TCP TCP	66 22824	5080 - 34154 (ACC) Seq-0 Ack-087015 Kin-05300 Len-0 TSval-1201150750 TSecr-1201150710  24154 - 5080 (ACC) Seq-067015 Ack-0 Min-05300 Len-21700 TSval-1201150750 TSecr-1201150750
79	2.242849956	127.0.0.1	127.0.0.1	TCP	22424	PAIR + Sew (ACA) SEQ-MANDES ACC-2 MEN-2508 LEN-1200 TOWN-1202150/19 TOWN-1-2101150/19 TOWN-1-2001150/19
80	2.240079585					[TCP Zeroklindow] 5060 = 34154 [ACK] Seq-9 Ack-1853551 kin-8 Len-8 TSval-2201150759 TSecr-2201150759
81	2.272685396	127.0.0.1	127.0.0.1	TCP	66	[TCP Nindow Update] 5868 + 34154 [ACX] Seq-9 Acx-1852551 Nin-46512 Len-8 TS/vs1-2381158792 TSecr-2281158759
62	2.272616514	127.0.0.1	127.0.0.1	TCP	4236	24154 - 5888 (PSH, ACK) Sec-1852551 Ack-9 Min-65536 Len-3978 TSval-3201158792 TSecr-3201158792
63	2.309690185	127.0.0.1	127.0.0.1	TCP	66	5800 ± 24154 [ACK] Seq-9 Ack-2856511 Min-46592 Len-8 TS:e1-2281158629 TSecr-2281158792
84	3.052745590	127.0.0.1	127.0.0.1	TCP	78	rader durgus; expandido dontarado dentalestacioniden deligar L

# Sending number 5:

	13.165112		127.0.0.1	TCP		[TCP Window Update] 5080 + 34154 [ACK] Seq=21 Ack=4389925 Win=48512 Len=0 TSval=3201161684 TSecr=3201161637
			127.0.0.1	TCP		34154 + 5080 [PSH, ACK] Seq=4389925 Ack=21 Win=65536 Len=32768 TSval=3201161684 TSecr=3201161684
343			127.0.0.1	TCP	66	5080 + 34154 [ACK] Seq=21 ACk=4422693 Win=15744 Len=0 TSval=3201161729 TSecr=3201161684
344			127.0.0.1	TCP	66	[TCP Window Update] 5080 → 34154 [ACK] Seq≈21 Ack≈4422693 Win=65536 Len∞0 TSval=3201161750 TSecr=3201161684
345		127.0.0.1	127.0.0.1	TCP	32834	34154 → 5080 [ACK] Seq-4422693 Ack-21 Win=65536 Len=32768 TSval=3201161750 TSecr=3201161750
346	13.230753	127.0.0.1	127.0.0.1	TCP		[TCP Window Full] 34154 + 5880 [PSH, ACK] Seq=4455461 Ack=21 Win=65336 Len=32768 TSval=3201161750 Tsecr=3201161750
347	13.230765	127.0.0.1	127.0.0.1		66	[TCP ZeroMindow] 5088 + 34154 [ACK] Seq=21 Ack=4488229 Win=0 Len=0 TSval=3201161750 TSecr=3201161750
	13.264693	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 34154 [ACK] Seq=21 Ack=4488229 Win=48512 Len=0 TSval=3201161784 TSecr=3201161750
349			127.0.0.1	TCP		34154 + 5080 [ACK] Seq=4488229 Ack=21 Win-65336 Len=32768 TSval=320161784 TSecr=3201161784
350		127.0.0.1	127.0.0.1	TCP	66	5888 + 34154 [ACK] Seq=21 Ack=4520997 Win=15744 Len=0 TSval=3201161827 TSecr=3201161784
	13.325550		127.0.0.1	TCP	66	[TCP Window Update] 5080 + 34154 [ACK] Seq=21 Ack=4520997 Win=65536 Len=0 TSval=3201161845 TSecr=3201161784
352 353	13.325583	127.0.0.1	127.0.0.1	TCP	32834 66	34154 + 5080 [PSH, ACK] Seq=4520997 Ack=21 Min=65536 Len=32768 TSval=3201161845 TSecr=3201161845
353		127.0.0.1	127.0.0.1			5080 + 34154 [ACK] Seq=21 Ack=4553765 Win=65536 Len=0 TSval=3201161870 TSecr=3201161845
354						[TCP Window Full] [TCP Previous segment not captured] 34154 → 5080 [PSH, ACK] Seq-4586533 Ack-21 Win-65536 Len=32768 TSval=3201161870 TSecr=3201161870 [TCP Dup ACK 353#1] 5080 → 34154 [ACK] Seq=21 Ack-4553765 Win-65536 Len=0 TSval=3201161870 TSecr=3201161845 SLE=4586533 SRE=4619301
		127.0.0.1	127.0.0.1	TCP		
356 357	13.351394	127.0.0.1	127.0.0.1	TCP		[TCP Out-Of-Order] 34154 + 5080 [ACK] Seq=4553765 Ack=21 Win=65536 Len=32768 TSval=3201161870 TSecr=3201161870 [TCP Zerokindow] 5080 + 34154 [ACK] Seq=21 Ack=4619301 Win=0 Len=0 TSval=3201161871 TSecr=3201161870
357	13.568270	127.0.0.1	127.0.0.1	TCP	**	[[CV_2670MINGOM]] 9000 + 34134 [RAK] SEQ#21 AKK#4019901 WINTHO LETHEN [SVML=32MILLOR] / ISECT=320110870 [TCP_Kens_Alive] 34134 + 5888 [AKK] Seq#41340 Akk#21 Minstel5536 [Lene] Txxxi=3201162087 TSECT=320116871
358	13.568270	127.0.0.1	127.0.0.1	TCP	66	[ICV Keep-Alive] 34154 + 3680 [ALK] Seq=40.1980 ACK-21 MIN-BOS30 Lenew ISV81=24011626/ ISCC=24011618/1 [TCP Mindow Update] 5880 + 34154 [ACK] Seq=21 Ack-461930 Min-BOS30 Lene ISV81=23011626/ ISCC=32011618/0
360		127.0.0.1	127.0.0.1	TCP	32834	
	13.568302		127.0.0.1	TCP	32034	34154 + 5080 [ACK] Seq=4619301 Ack=21 Win=6536 Len=32768 Tsval=3201162087 TSecr=3201162087
	14.006334		127.0.0.1	TCP		5080 → 34154 [ACK] Seq=21 Ack=4652069 Win=40512 Len=0 TSval=3201162087 TSecr=3201162087  34154 → 5080 [PSH, ACK] Seq=4652069 Ack=21 Win=65536 Len=32768 TSval=3201162525 TSecr=3201162087
						2-3
	14.006350	127.0.0.1	127.0.0.1	TCP	66	5080 + 34154 [ACK] Seq=21 Ack=4664837 Win=48512 Len=0 TSval=3201162525 TSecr=3201162525
364			127.0.0.1	TCP TCP	32834	34154 + 5880 [ACK] Seq=4684837 ACk-21 Win=65536 Len-32768 Tsval=3201162741 TSecr=3201163755
365	14.221765	127.0.0.1	127.0.0.1		66	5880 + 34154 [ACK] Seq=21 Ack=4717605 Win-48512 Len-0 TSval=3201162741 TSecr=3201162741
			127.0.0.1	TCP		34154 → 5080 [PSH, ACK] Seq=4717605 Ack=21 Win=65536 Len=32768 TSval=3201162741 Tsecr=3201162741  5080 → 34154 [ACK] Seq=21 Ack=4750373 Win=15744 Len=0 TSval=320116741 Tsecr=3201167741
	14.221844	127.0.0.1			66	(,,
368	14.314139	127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 + 34154 [ACK] Seq*21 Ack*4750373 Win=65536 Len=0 TSval=3201162833 TSecr=3201162741  34154 + 5080 [PSH, ACK] Seq=4750373 Ack*21 Win=65536 Len=3970 TSval=3201162952 TSecr=3201162833
369			127.0.0.1	TCP	4036	
370	14.432792	127.0.0.1	127.0.0.1	TCP	66	5080 → 34154 [ACK] Seq=21 Ack=4754343 Win=62976 Len=0 TSval=3201162952 TSecr=3201162952  [5080 → 34154 [PSH, ACK] Seq=21 Ack=4754343 Win=65336 Len=4 TSval=3201163159 TSecr=3201162952
371			127.0.0.1	TCP		1,5080 → 54154 [PSH, ACK] Seq=2T. Ack=4754343 Min=65536 Len=4 ISval=2201163159 ISecr=3201163159  34154 → 5080 [ACK] Seq=4754343 Ack=2S Win=65536 Len=22768 TSval=3201163159 TSecr=3201163159
372	14.640354	127.0.0.1	127.0.0.1	TCP	32834	
3/3		127.0.0.1	127.0.0.1			[TCP Window Full] 34154 + 5880 [PSH, ACK] Seq=4787111 Ack=25 Win=65336 Len=32768 TSval=3201163160 T5ecr=3201163159
374		127.0.0.1	127.0.0.1	TCP	66	[TCP Zerokindow] 5880 → 34154 [ACK] Seq=25 Ack=4819879 Win=0 Len=0 TSval=3201163160 TSecr=3201163159
375	14.705114	127.0.0.1	127.0.0.1		66	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4819879 Win=48512 Len=0 TSval=3201163224 TSecr=3201163159  34154 + 5080 [ACK] Seq=4819879 Ack=25 Win=65536 Len=32768 TSval=3201163224 TSecr=3201163224
				TCP TCP		
		127.0.0.1	127.0.0.1		66	5880 + 34154 [ACK] Seq=25 Ack=4852647 Win=15744 Len=0 TSval=3201163265 TSecr=3201163224
378		127.0.0.1	127.0.0.1	TCP	66	[TCP Window Update] 5080 → 34154 [ACK] Seq=25 Ack=4852647 Win=65536 Len=0 TSval=3201163285 TSecr=3201163224
3/9	14.766282	127.0.0.1	127.0.0.1	TCP		[TCP Window Full] [TCP Previous segment not captured] 34154 - 5889 [ACK] Seq=4885415 Ack=25 Win=65336 Len=32768 TSval=3280163285 TSecr=3281163285
381		127.0.0.1	127.0.0.1	TCP		[TCP Dup ACK 377#1] 5880 -> 34154 [ACK] Seq=25 ACK=4852647 Win=65536 Len=0 TSval-3201163285 TSecr=3201163224 SLE=4885415 SRE=4918183
382	14.791192				32834 66	[TCP Retransmission] 34154 + 5880 [PSH, ACK] Seq=4852647 Ack=25 Wine5536 Len=32768 Tsval=3201163310 TSecr=3201163285
		127.0.0.1	127.0.0.1	TCP	66	[TCP ZeroMindow] 5000 + 34154 [ACK] Seq=25 Ack=4918183 Win=0 Len=0 TSvsl-3201163311 Tsccr=3201163310
383	14.853307	127.0.0.1	127.0.0.1	TCP	32834	[TCP Window Update] 5680 + 34154 [ACK] Seq=25 Ack-4918183 Win=48512 Len=9 TSval=3201163372 TSecr=3201163310
204		107 0 0 1			32034	34154 → 5080 [PSH, ACK] Seq=4918183 Ack=25 Win=65536 Len=32768 TSval=3201163372 TSecr=3201163372
384		127.0.0.1	127.0.0.1	TCD	66	E080 - 24154 [ACV] Soc-25 Ack-4050051 Hin-15744 Lon-0 TSupl-2201162271
385	14.871835	127.0.0.1	127.0.0.1	TCP	66	5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=15744 Len-0 TSval=3201163391 TSecr=3201163372
385 386	14.871835 15.032398	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP	66	[TCP Window Update] 5080 → 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-0 TSval-3201163551 TSecr-3201163372
385 386 387	14.871835 15.032398 15.032414	127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP	66 32834	[TCP Window Update] 5080 → 34134 [ACK] Seq≈25 Ack≈4950951 Win=65536 Len=0 TSval=3201163551 TSecr=3201163372 34154 → 5080 [ACK] Seq≈4950951 Ack≈25 Win=65536 Len≈32768 TSval=3201163551 TSecr=3201163551
385 386 387 388	14.871835 15.032398 15.032414 15.032424	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP	66 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=65536 Len=0 TSval=3201163551 TSecr=3201163372 34154 + 5080 [ACK] Seq=4950951 Ack=25 Win=65536 Len=32768 TSval=3201163551 TSecr=3201163551 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=32768 Len=0 TSval=3201163551 TSecr=3201163551
385 386 387	14.871835 15.032398 15.032414 15.032424 15.061972	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP	66 32834 66 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-0 TSval-3201163551 TSecr-3201163372 34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-02768 TSval-3201163551 TSecr-3201163551 5800 + 34154 [ACK] Seq-25 Ack-4983719 Win-92768 Len-02768 TSval-3201163551 TSecr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSecr-3201163551
385 386 387 388 389	14.871835 15.032398 15.032414 15.032424 15.061972 15.061991	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP	66 32834 66 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=65536 Len=0 TSval=3201163551 TSecr=3201163372 34154 + 5080 [ACK] Seq=495 Ack=4950951 Ack=25 Win=65536 Len=02768 TSval=3201163551 TSecr=3201163551 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=32768 Len=0 TSval=3201163551 TSecr=3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 TSval=3201163581 TSecr=3201163551 [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq=5016487 Ack=25 Win=65536 Len=32768 TSval=3201163581 TSecr=3201163581
385 386 387 388 389 390 391	14.871835 15.032398 15.032414 15.032424 15.061972 15.061991 15.062001	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=65536 Len=0 TSval=3201163551 TSecr=3201163372  34154 + 5080 [ACK] Seq=25 Ack=4980951 Ack=25 Win=65536 Len=02768 TSval=3201163551 TSecr=3201163551  5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=32768 Len=0 TSval=3201163551 TSecr=3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 TSval=3201163581 TSecr=3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 + 5880 [ACK] Seq=25 Ack=25 Win=65536 Len=32768 TSval=3201163581 TSecr=3201163581  [TCP Dup ACK 388#1] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 TSval=3201163581 TSecr=3201163551 SEcr=3201163581
385 386 387 388 389 390 391 392	14.871835 15.032398 15.032414 15.032424 15.061972 15.061991 15.062001 15.062012	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=65536 Len=0 TSval=3201163551 TSecr=3201163372 34154 + 5080 [ACK] Seq=4950951 Ack=25 Win=65536 Len=032768 TSval=3201163551 TSecr=3201163551 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=32768 Len=0 TSval=3201163551 TSecr=3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 TSval=3201163551 [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq=30816487 Ack=25 Win=65536 Len=32768 TSval=3201163581 TSecr=3201163581 [TCP Up ACK 38881] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 TSval=3201163581 TSecr=3201163551 SLE=5016487 SRE=5049255 [TCP Out-Of-Order] 34154 + 5080 [PSH, ACK] Seq=4983719 Ack=25 Win=65536 Len=32768 TSval=3201163581 TSecr=3201163581
385 386 387 388 389 390 391 392 393	14.871835 15.032398 15.032414 15.032424 15.061972 15.061991 15.062001 15.062012	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-0 TSval-3201163551 TSecr-3201163372  34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-0 2768 TSval-3201163551 TSecr-3201163551  5080 + 34154 [ACK] Seq-25 Ack-4963739 Win-52768 Len-0 TSval-3201163551 TSecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-0 TSval-3201163581 TSecr-3201163551  [TCP Window Full] [TCP Previous segment not captures] 34154 - 5080 [ACK] Seq-2616487 Ack-25 Win-65536 Len-32768 TSval-3201163581 TSecr-3201163581  [TCP Dut-Ort-Order] 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSecr-3201163551 Secr-3201163561  [TCP Out-Ort-Order] 34154 + 5080 [PSM, ACK] Seq-4983719 Ack-25 Win-65536 Len-0 TSval-3201163581 TSecr-3201163581 TSecr-3201163581  [TCP Out-Ort-Order] 34154 + 5080 [PSM, ACK] Seq-4983719 Ack-25 Win-65536 Len-0 TSval-3201163581 TSecr-3201163581  [TCP Out-Ort-Order] 34154 + 5080 [PSM, ACK] Seq-4983719 Ack-25 Win-65336 Len-0 TSval-3201163581 TSecr-3201163581
385 386 387 388 389 390 391 392 393	14.871835 15.032398 15.032414 15.032424 15.061972 15.061991 15.062001 15.062012 15.062022 15.094606	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 66 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 Tsecr-3201163372 34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-92768 Tsval-3201163551 Tsecr-3201163551 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-92768 Len-90 Tsval-3201163551 Tsecr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-0 Tsval-3201163581 Tsecr-3201163551 [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Tsecr-3201163581 [TCP DUp ACK 38881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-32768 Tsval-3201163581 Tsecr-3201163581 [TCP Out-of-Order] 34154 + 5080 [PSH, ACK] Seq-4983719 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Tsecr-3201163581 [TCP Out-of-Order] 34154 Seq-25 Ack-3049255 Win-601560 Len-32768 Tsval-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-3049255 Win-801560 Len-32768 Tsval-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-801560 Tspal-3201163581 Tsecr-3201163581
385 386 387 388 389 390 391 392 393 394 395	14.871835 15.032398 15.032414 15.032424 15.061972 15.062901 15.062012 15.062022 15.094606 15.094631	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32334 78 32384 66 66	[TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4950951 Win=65536 Len=32768 Tsval=3201163551 Tsecr=3201163372  34154 + 5680 [ACK] Seq=4596951 Ack=25 Win=65536 Len=32768 Tsval=3201163551 Tsecr=3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=5536 Len=0 Tsval=3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 + 5880 [ACK] Seq=5016487 Ack=25 Win=65536 Len=32768 Tsval=3201163581 Tsecr=3201163581  [TCP Update] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 Tsval=3201163581 Tsecr=3201163581  [TCP Dup ACK 388#1] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Win=65536 Len=0 Tsval=3201163581 Tsecr=3201163581 Tsecr=3201163581  [TCP Dup ACK 388#1] 5080 + 34154 [ACK] Seq=25 Ack=4983719 Ack=25 Win=65536 Len=32768 Tsval=3201163581 Tsecr=3201163581  [TCP ZeroWindow 15080 + 34154 [ACK] Seq=25 Ack=5049255 Win=65536 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=65536 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=48512 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=48512 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=48512 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=48512 Len=0 Tsval=3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq=25 Ack=5049255 Win=48512 Len=0 Tsval=3201163581
385 386 387 388 389 390 391 392 393 394 395	14.871835 15.032398 15.032414 15.032424 15.061972 15.062901 15.062012 15.062022 15.094606 15.094631 15.308659	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 66 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 Tsecr-3201163351  34154 + 5080 [ACK] Seq-25 Ack-49803719 Win-65536 Len-92766 Tsval-3201163551 Tsecr-3201163551  5080 + 34154 [ACK] Seq-25 Ack-49803719 Win-92768 Len-9 Tsval-3201163551 Tsecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-49803719 Win-65536 Len-9 Tsval-3201163581 Tsecr-3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-3816487 Ack-25 Win-65536 Len-9 Tsval-3201163551 Tsecr-3201163551 Tsecr-3201163561  [TCP Dup ACK 30821] 5080 + 34154 [ACK] Seq-25 Ack-49803719 Win-65536 Len-0 Tsval-3201163561 Tsecr-3201163551 Tsecr-3201163561  [TCP Dup ACK 30821] 5080 + 34154 [ACK] Seq-25 Ack-49803719 Win-65536 Len-0 Tsval-3201163581 Tsecr-3201163561 Tsecr-3201163561  [TCP Cont-0f-Order] 34154 + 5080 [PSH, ACK] Seq-49803719 Ack-25 Win-65536 Len-0 Tsval-3201163581 Tsecr-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-65536 Len-3768 Tsval-3201163828 Tsecr-3201163614
385 386 387 388 389 390 391 392 393 394 395 396	14.871835 15.032398 15.032414 15.061972 15.061972 15.062012 15.062012 15.062022 15.094606 15.308659 15.308683	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 66 66 32834 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 Tsccr-3201163372  34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-9 Z768 Tsval-3201163551 Tsccr-3201163551  5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-92768 Len-9 Z768 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Tsccr-3201163581  [TCP WINDOW Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Ster-3201163581 Ster-3201163581 Ster-3201163581 Tsccr-3201163581 Tsccr-3201163581 Tsccr-3201163581 Tsccr-3201163581  [TCP WINDOW Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-65536 Len-32768 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-48512 Len-0 Tsval-3201163614 Tsccr-3201163581  34154 + 5080 [PSH, ACK] Seq-5049255 Ack-5049255 Win-65536 Len-32768 Tsval-3201163614 Tsccr-3201163614  5080 + 34154 [ACK] Seq-25 Ack-5082023 Win-65536 Len-0 32768 Tsval-320116382 Tsccr-3201163614  5080 + 34154 [ACK] Seq-25 Ack-5082023 Win-65536 Len-0 Tsval-320116382 Ster-320116382 Ster-5082023
385 386 387 388 389 390 391 392 393 394 395 396	14.871835 15.032398 15.032424 15.032424 15.061972 15.061991 15.062012 15.062022 15.094604 15.094603 15.308659 15.308697	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 66 66 32834 32834 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551 34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-95536 Len-0 Tsval-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551 Tsccr-3201163551 [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Tsccr-3201163581 [TCP DUD ACK 38881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551 Stc-5040255 [TCP Out-of-order] 34154 + 5080 [PSH, ACK] Seq-4983719 Ack-25 Win-65536 Len-0 32768 Tsval-3201163581 Tsccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-3201163504 Tsccr-3201163581 [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-5040255 Ack-25 Win-05536 Len-0 Tsval-3201163614 Tsccr-3201163614 [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-5040255 Ack-25 Win-05536 Len-0 Tsval-3201163828 Tsccr-3201163614  5080 + 34154 [ACK] Seq-25 Ack-5082023 Ack-25 Win-05536 Len-0 Tsval-3201163828 Tsccr-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-5082023 Ack-25 Win-05536 Len-0 Tsval-3201163828 Tsccr-3201163828
385 386 387 388 389 390 391 392 393 394 395 396 397 398	14.871835 15.032398 15.032414 15.061992 15.061991 15.062012 15.062012 15.062012 15.094606 15.094631 15.308599 15.308697 15.308707	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 78 32834 78 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 Tsccr-3201163551  34154 + 5080 [ACK] Seq-26 Ack-4983179 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551  [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551 Tsccr-3201163581  [TCP Dup ACK 30841] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163581 Tsccr-3201163581  [TCP Dup ACK 30841] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163581 Tsccr-3201163581  [TCP Put-0f-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-5040255 Win-86536 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-86536 Len-0 Tsval-3201163614 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-86536 Len-0 Tsval-3201163614 Tsccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-5049255 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-5049255 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-5040233 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-5040233 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-5040233 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163828  34154 5080 + 34154 [ACK] Seq-5040255 Ack-5114791 Win-48512 Len-0 Tsval-3201163828 Tsccr-3201163828
385 386 387 388 389 390 391 392 393 394 395 396 397 398	14.871835 15.03298 15.032414 15.032414 15.061972 15.062091 15.062012 15.062022 15.094606 15.308659 15.308697 15.308697 15.531347	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1 127.8.8.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 52834 78 32834 66 66 32834 32834 68 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 Tsccr-3201163551  34154 + 5080 [ACK] Seq-4969951 Ack-25 Win-65536 Len-9 Z768 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551  [TCP Dup ACK 3881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551 SLE-5016487 SRE-5049255  [TCP Dup ACK 3881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551 SLE-5016487 SRE-5049255  [TCP Out-Or-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-59807255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-320116351 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-3201163614 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 Tsval-3201163614 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-6536 Len-32768 Tsval-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-6536 Len-32768 Tsval-3201163828  34154 + 5080 [PSH, ACK] Seq-25 Ack-25 Win-6536 Len-32768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-5082023 Ack-25 Win-65536 Len-32768 Tsval-3201163828  34154 + 5080 [PSH, ACK] Seq-5082023 Ack-25 Win-65536 Len-0 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [PSH, ACK] Seq-5082023 Ack-25 Win-65536 Len-0 Tsval-3201163628 Tsccr-3201163828
385 386 387 388 389 391 392 393 394 395 396 397 398 399 400	14.871835_ 15.032398_ 15.032444_ 15.032444_ 15.061972_ 15.061972_ 15.062091_ 15.062001_ 15.062022_ 15.094606_ 15.094606_ 15.09683_ 15.308697_ 15.308697_ 15.531447_ 15.531448_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1 127. 8.8.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 32834 32834 66 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551  34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-5016487 Ack-25 Win-65536 Len-32768 Tsval-3201163581 Tsccr-3201163581  [TCP Upd ACK 38881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 Tsccr-3201163551 Stc-5016487 SRE-5049255  [TCP Out-of-Order] 34154 + 5080 [PSH, ACK] Seq-45843719 Ack-25 Win-65536 Len-0 32768 Tsval-3201163581 Tsccr-3201163581  [TCP Vindow Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 Tsval-3201163581 Tsccr-3201163581  5080 + 34154 [ACK] Seq-5049255 Ack-25 Win-65536 Len-32768 Tsval-320116382 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-5082203 Win-65536 Len-0 Tsval-320116382 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-514759 Win-65536 Len-0 Tsval-320116308 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-514759 Win-65536 Len-0 Tsval-320116308 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-514759 Win-6536 Len-0 Tsval-320116308 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-514759 Win-6536 Len-0 Tsval-320116308 Tsccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-514759 Win-6536 Len-0 Tsval-320116308 Tsccr-320116382
385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402	14.871835_ 15.032298_ 15.032414_ 15.032424_ 15.061972_ 15.061991_ 15.062091_ 15.062001_ 15.062001_ 15.062001_ 15.094061_ 15.308690_ 15.3086707_ 15.3086707_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32334 66 66 32834 78 32334 66 66 32834 78 32834 66 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 Tsval-3201163551 TSecr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4983719 Win-65536 Len-92768 TSval-3201163551 TSecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163551 TSecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 TSecr-3201163551  [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 TSecr-3201163551 TSecr-3201163551  [TCP Dup ACK 3084] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 TSecr-3201163551 TSecr-3201163551 TSecr-3201163581  [TCP Dup ACK 3084] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 Tsval-3201163581 TSecr-3201163551 TSecr-3201163581  [TCP Vindow Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-8536 Len-32768 Tsval-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-8512 Len-0 Tsval-3201163581 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-8512 Len-0 Tsval-3201163614 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-8512 Len-0 Tsval-3201163614 TSecr-3201163614  [TCP Retransatission] 34154 5080 [PSH, ACK] Seq-5049255 Ack-25 Win-6536 Len-32768 Tsval-3201163614 TSecr-3201163614  [TCP Retransatission] 34154 5080 [PSH, ACK] Seq-5049255 Ack-25 Win-6536 Len-32768 TSval-3201163828 TSecr-3201163614  [TCP Retransatission] 34154 5080 [PSH, ACK] Seq-5049255 Ack-5040255 Ack-5040260 Win-6536 Len-32768 TSval-3201163828  [S080 + 34154 [ACK] Seq-5040260 Ack-55 Win-65536 Len-32768 TSval-3201163828 TSecr-3201163828  [S080 + 34154 [ACK] Seq-5040260 Ack-55 Win-65536 Len-32768 TSval-3201163828  [S080 + 34154 [ACK] Seq-5040260 Ack-55 Win-65536 Len-32768 TSval-3201163828  [S080 + 34154 [ACK] Seq-5040270 Ack-55 Win-65536 Len-32768 TSval-3201163828  [S080 + 34154 [ACK] Seq-5040270 Ack-55 Win-65536 Len-32768 TSval-3201163828  [S080 + 34154 [ACK] Seq-5040270 Ack-55 Win-65536 Len-32768 TSval-320
385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403	14.871835_ 15.032398_ 15.032398_ 15.032414_ 15.061972_ 15.061991_ 15.062091_ 15.062012_ 15.062012_ 15.094606_ 15.308683_ 15.308697_ 15.308687_ 15.33147_ 15.531468_ 15.531488_ 15.531481_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 78 32834 66 32834 66 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-9 TSval-3201163551 TSccr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4960951 Ack-25 Win-65536 Len-9 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163551 TSccr-3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 - 5080 [ACK] Seq-25 Ack-5983719 Win-65536 Len-0 TSval-3201163561 TSccr-3201163551 LEt-5016487 SRE-5049255  [TCP DUT-OT-OTOPEN] 34154 + 5080 [ACK] Seq-25 Ack-49803719 Win-65536 Len-0 TSval-3201163561 TSccr-3201163551 LEt-5016487 SRE-5049255  [TCP Cott-OT-OTOPEN] 34154 + 5080 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163561 TSccr-3201163561  [TCP ZeroWindow] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163561 TSccr-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163561 TSccr-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163561 TSccr-3201163561  [TCP Retransmission] 34154 + 5080 [FSN, ACK] Seq-5049255 Ack-5049255 Win-65536 Len-32768 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-65536 Len-0 TSval-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049254 Min-65536 Len-0 TSval-3201163828  [TCP Window Upd
385 386 387 388 389 391 392 393 394 395 396 397 398 399 400 401 402 403 404	14.871835_ 15.932414_ 15.932414_ 15.961972_ 15.061972_ 15.062022_ 15.062022_ 15.062022_ 15.094631_ 15.308683_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_ 15.308697_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127, 0, 0, 1 127, 0, 0, 1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 63 32834 32834 66 32834 66 32834 66 32834 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4983739 Win-65536 Len-92768 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 Tsval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 Tsval-3201163551 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163581 Tsccr-3201163581  [TCP Up ACK 3881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163581 Stc-5049255  [TCP Out-Or-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-5049255 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163581  [TCP Vindow Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-65536 Len-9 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-65536 Len-32768 Tsval-3201163581 Tsccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-65536 Len-32768 Tsval-3201163828  [TCP Window Update] 5080 PSH, ACK] Seq-5080255 Ack-25 Win-65536 Len-32768 Tsval-3201163828  34154 + 5080 [PSH, ACK] Seq-5080203 Ack-25 Win-65536 Len-32768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-514759 Win-65536 Len-92768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-514759 Win-65536 Len-92768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-514759 Win-65536 Len-92768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-5147559 Win-65536 Len-92768 Tsval-3201163828 Tsccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-5147559 Win-65536 Len-92768 Tsval-3201163809 Tsccr-3201163809  34154 - 5080 [ACK] Seq-25 Ack-5147559 Win-65536 Len-92768 Tsval-3201164050 Tsccr-3201164050  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5180327 Win-65536 Len-92768 Tsval-3201164050
385 386 387 388 399 391 392 393 394 395 396 397 398 399 400 401 402 403 404	14.871835_ 15.032398_ 15.032398_ 15.032424_ 15.061972_ 15.061991_ 15.062091_ 15.062091_ 15.062091_ 15.094631_ 15.308683_ 15.308683_ 15.308683_ 15.3147_ 15.31481_ 15.531488_ 15.531481_ 15.5636931_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32334 66 66 32834 78 32834 66 66 32834 52834 66 32834 66 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-49693719 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551  [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163561 TSccr-3201163561 TSccr-3201163561 TSccr-3201163561 TSccr-3201163581  [TCP Dut-0f-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-5040255 Win-6536 Len-0 TSval-3201163561 TSccr-3201163581 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-6536 Len-0 TSval-3201163561 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-6536 Len-0 TSval-3201163561 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Min-6536 Len-0 TSval-3201163614 TSccr-3201163614  [TCP Retransatission] 34154 + 5080 [PSH, ACK] Seq-3604255 Ack-25 Win-6536 Len-0 TSval-3201163628 TSccr-3201163614  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5082023 Win-6536 Len-0 TSval-3201163828 TSccr-3201163628 TSccr-3201163614  [TCP Window Update] 5080 + 34154 [ACK] Seq-3604255 Ack-25 Win-6536 Len-0 TSval-3201163828 TSccr-3201163828 TSccr-3201163614  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-508203 Win-6536 Len-0 TSval-3201163828 TSccr-3201163828 TSccr-3201163628  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-508203 Win-6536 Len-0 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-508203 Win-6536 Len-32768 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-25 Ack-5147559 Win-6536 Len-32768 TSval-3201164050 TSccr-32
385 386 387 388 389 391 392 393 394 395 396 397 398 400 401 402 403 404 405	14.871835_ 15.032398_ 15.032398_ 15.032444_ 15.061972_ 15.061972_ 15.062012_ 15.062012_ 15.062022_ 15.062022_ 15.094631_ 15.308659_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 32834 78 32834 66 32834 66 32834 66 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92766 TSval-3201163551 TSccr-3201163551 34154 + 5080 [ACK] Seq-25 Ack-49683719 Win-65276 Len-92766 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-91768 TSval-3201163581 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 [TCP Window Full] [TCP Previous segment not captured] 34154 + 5080 [ACK] Seq-364687 Ack-25 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 SLE-5016487 SRE-5049255 [TCP DUT-Of-Order] 34154 + 5080 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 SLE-5016487 SRE-5049255 [TCP OUT-Of-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163581 TSccr-3201163581 [TCP ZeroWindow] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163581 TSccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163581 TSccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163581 TSccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-6536 Len-32768 TSval-320116382 TSccr-320116382
385 386 387 388 390 391 392 393 394 490 491 492 493 494 494 495 496 497	14.871835_ 15.032398_ 15.032398_ 15.032444_ 15.061972_ 15.061971_ 15.062011_ 15.062011_ 15.062021_ 15.062021_ 15.062021_ 15.062021_ 15.308683_ 15.308683_ 15.308683_ 15.308681_ 15.308681_ 15.30876_ 15.531468_ 15.531468_ 15.531468_ 15.53156300_ 15.630001_ 15.630001_	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 32834 66 32834 66 32834 66 32834 66 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-6536 Len-92768 TSval-3201163551 TSccr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4960951 Ack-25 Win-6536 Len-92768 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65356 Len-9 TSval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163551 TSccr-3201163551  [TCP Window Full] [TCP Previous segment not captures] 34154 - 5080 [ACK] Seq-26 Ack-983719 Win-65536 Len-9 TSval-3201163561 TSccr-3201163551 Stal-5016487 SRE-5049255  [TCP DUP ACK 3881] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163581 TSccr-3201163551 Stal-5016487 SRE-5049255  [TCP Out-Or-Order] 34154 + 5080 [PSN, ACK] Seq-25 Ack-9803719 Win-65536 Len-9788 TSval-3201163581 TSccr-3201163561  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 TSval-3201163561 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 TSval-3201163561 TSccr-3201163581  [TCP Window Update] 5080 + 34154 Seq. 5080 [PSN, ACK] Seq-25 Ack-5040255 Win-05536 Len-32768 TSval-3201163614 TSccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSN, ACK] Seq-5080255 Ack-5040255 Win-65536 Len-32768 TSval-3201163828 TSccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSN, ACK] Seq-5080255 Ack-5040255 Win-65536 Len-32768 TSval-3201163828 TSccr-3201163828  34154 + 5080 [ACK] Seq-5080203 Ack-25 Win-65536 Len-32768 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSN, ACK] Seq-5080203 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-3201163828  34154 + 5080 [PSN, ACK] Seq-5080203 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSN, ACK] Seq-514759 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSN, ACK] Seq-514759 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSN, ACK] Seq-514759 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSN, ACK] Seq-5147559 Ack-5180327 Win-15744 Len
385 386 387 389 390 391 392 393 394 395 396 397 400 401 402 403 404 405 405	14.871835_ 15.032298_ 15.032244_ 15.061972_ 15.061972_ 15.062691_ 15.062691_ 15.062691_ 15.062691_ 15.094661_ 15.306631_ 15.306631_ 15.306631_ 15.306631_ 15.31468_ 15.531468_  15.531468_ 15.531468_  15.531468_ 15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468_  15.531468	127.0.0.1 127.0.0.1	127. 0.0.1 127. 0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 32834 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551 34154 + 5080 [ACK] Seq-25 Ack-4983719 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-320116351 TSccr-320116351 TSccr-3201163581 [TCP Dup-ACK 30841] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5080755 Win-85136 Len-0 TSval-3201163581 TSccr-3201163581 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040755 Win-85136 Len-0 TSval-3201163581 TSccr-3201163581  A154 + 5080 [FSH, ACK] Seq-5040255 Ack-5040255 Win-85136 Len-0 TSval-3201163614 TSccr-3201163614  TCP Retransatiosion 34154 + 5080 [PSH, ACK] Seq-36049255 Ack-5040255 Win-85136 Len-0 TSval-3201163614 TSccr-3201163614  TCP Retransatiosion 34154 + 5080 [PSH, ACK] Seq-36049255 Ack-5040255 Win-85136 Len-0 TSval-3201163628 TSccr-3201163828 TSccr-3201163614  TCP Retransatiosion 34154 + 5080 [PSH, ACK] Seq-36049255 Ack-5040255 Ack-5040263 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-5082023 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSH, ACK] Seq-5144791 Win-68512 Len-0 TSval-3201164950 TSccr-320116490  34154 + 5080 [ACK] Seq-5145959 Ack-25 Win-65536 Len-032768 TSval-3201164950 TSccr-320116490  34154 + 5080 [ACK] Seq-5145959 Ack-25 Win-65536 Len-032768 TSval-3201164950 TSccr-320116490  34154 + 5080 [ACK] Seq-5145959 Ack-25 Win-65536 Len-032768 TSval-320116495 TSccr-320116490  34154 + 5080 [PSH, ACK] Seq-514659 Ack-52 Win-65536 Len-032768 TSval-320116492 TSccr-3201164
385 386 387 388 389 390 391 392 393 394 495 496 497 498 498 499	14.871835_ 15.032238_ 15.032244_ 15.061972_ 15.061972_ 15.061972_ 15.062022_ 15.062022_ 15.064631_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 32834 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834 4836	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551 34154 + 5080 [ACK] Seq-25 Ack-49693719 Win-65236 Len-92768 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-07 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-07 TSval-3201163561 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-07 TSval-3201163561 TSccr-3201163551 LEt-5016487 SRE-5049255 [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-07 TSval-3201163561 TSccr-3201163551 LEt-5016487 SRE-5049255 [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-5980255 Win-80 Len-07 TSval-3201163561 TSccr-3201163561 TSccr-3201163561 [TCP Acroalindow] 5080 + 34154 [ACK] Seq-25 Ack-5840255 Win-86536 Len-07 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-86536 Len-07 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-86536 Len-07 TSval-3201163614 TSccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-5404255 Win-86536 Len-07 TSval-3201163628 TSccr-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5404255 Win-86536 Len-07 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5404255 Win-86536 Len-07 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5404255 Win-86536 Len-07 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5404255 Win-86536 Len-07 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5540582 Win-86536 Len-07 TSval-3201164050  34154 + 5080 [PSH, ACK] Seq-5147559 Win-86536 Len-07 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-5147559 Win-86536 Len-32768 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-5147559 Win-86536 Len-32768 TSval-3201164050 TSccr-3201164182  [TCP Window Update] 5080 + 3
385 386 387 389 391 392 393 394 395 396 490 401 402 403 404 405 406 407 408 409 410	14.871835_ 15.032398_ 15.032398_ 15.032444_ 15.061972_ 15.061991_ 15.062011_ 15.062011_ 15.062012_ 15.094606_ 15.308683_ 15.308687_ 15.308687_ 15.33147_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.53147_ 15.651091_ 15.65621_ 15.66621_ 15.666278_ 15.666278_ 15.666278_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 78 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834 66 32834	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-6536 Len-92768 TSval-3201163551 TSccr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4960951 Ack-25 Win-6536 Len-92768 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-6536 Len-9 TSval-3201163551 TSccr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-6536 Len-9 TSval-3201163581 TSccr-3201163551  [TCP Window Full] [TCP Previous segment not captured] 34154 - 5080 [ACK] Seq-26 Ack-4983719 Win-6536 Len-9 TSval-3201163581 TSccr-3201163551 Stc-504687 SRk-5049255  [TCP Out-Or-Order] 34154 - 5080 [ACK] Seq-25 Ack-49803719 Win-6536 Len-9 TSval-3201163501 TSccr-3201163551 Stc-504687 SRk-5049255  [TCP Out-Or-Order] 34154 - 5080 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163501 TSccr-3201163581  [TCP ZeroWindow] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163501 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163501 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163614 TSccr-320116381  [TCP Retransmission] 34154 + 5080 [FSH, ACK] Seq-3049255 Ack-5049255 Win-6536 Len-32768 TSval-3201163828 TSccr-3201163828  [TCP Window Update] 5080 + 34154 [ACK] Seq-5049255 Min-6536 Len-32768 TSval-3201163828 TSccr-3201163828  34154 + 5080 [FSH, ACK] Seq-5082023 Ack-25 Win-65536 Len-32768 TSval-3201163828 TSccr-3201163828  34154 + 5080 [FSH, ACK] Seq-51Ack-5114791 Win-48512 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [FSH, ACK] Seq-51Ack-5114791 Min-48512 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [FSH, ACK] Seq-5180327 Win-65536 Len-32768 TSval-3201164950  34154 + 5080 [FSH, ACK] Seq-5180327 Win-65536 Len-32768 TSval-3201164950  34154 + 5080 [FSH, ACK] Seq-5180327 Ack-25 Win-65536 Len-32768 TSval-3201164950  34154 + 5080 [FSH, ACK] Seq-5180327 Ack-25 Win-65536 Len-32768 TSval-3201164950  34154 + 5080 [FSH, ACK] Seq-52863 Ack-5180556 Len-32768 TSval-320116495 TSccr-32011649
385 386 387 388 389 390 391 392 393 394 490 401 402 403 404 405 406 407 408 409 409 409 409 409 409 409 409 409 409	14.871835_ 15.032398_ 15.032424_ 15.061972_ 15.062691_ 15.062691_ 15.062691_ 15.062691_ 15.062691_ 15.094661_ 15.306631_ 15.306697_ 15.308787_ 15.31468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.566622_ 15.6666281_ 15.6666881_ 15.6666881_ 15.6666881_ 15.6666881_ 15.6666881_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 63 32834 66 32834 66 32834 66 32834 66 32834 66 66 32834 66 66 66 66 66	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-6536 Len-92768 TSval-3201163551 TSecr-3201163551  34154 + 5080 [ACK] Seq-25 Ack-4983739 Win-6536 Len-92768 TSval-3201163551 TSecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 TSval-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 TSval-3201163551 TSecr-3201163551  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 TSval-3201163581 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 TSval-3201163581 TSecr-3201163581 TSecr-3201163581  [TCP WINDOW Update] 5080 + 34154 [ACK] Seq-25 Ack-4983739 Win-65536 Len-9 TSval-3201163581 TSecr-3201163581 SLE-5040487 SRE-5049255  [TCP Out-Or-Or-Or-Or-19415+ 5080] FSW, ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-3201163581 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-320116351 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-320116361 TSecr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-0 Len-0 TSval-320116361 TSecr-320116381  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5049255 Win-05536 Len-32768 TSval-320116382 TSecr-320116381  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5082023 Win-65536 Len-32768 TSval-320116382 SEcr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-5147917 Win-05536 Len-32768 TSval-3201163828 TSecr-3201163828  34154 + 5080 [ACK] Seq-25 Ack-5147917 Win-05536 Len-32768 TSval-3201164960 TSecr-320116490  34154 + 5080 [ACK] Seq-254 Ack-5180327 Win-65536 Len-32768 TSval-3201164960 TSecr-320116490  34154 + 5080 [ACK] Seq-254 Ack-5180327 Win-65536 Len-32768 TSval-3201164960 TSecr-320116490  34154 + 5080 [ACK] Seq-254 Ack-5180327 Win-65536 Len-32768 TSval-3201164960 TSecr-320116490  34154 + 5080 [ACK] Seq-254 Ack-5180327 Win-65536 Len-32768 TSval-320116490 TSecr-320116490  34154 + 5080 [ACK] Seq-254 Ack-5180327 Win-65536 Len-32768 TSval-320116490
385 386 387 398 399 391 392 393 395 396 397 400 401 402 403 404 405 406 407 408 409 410 411 412	14.871835_ 15.032238_ 15.032244_ 15.032424_ 15.061972_ 15.061991_ 15.062091_ 15.062091_ 15.062091_ 15.094661_ 15.308697_ 15.308683_ 15.308683_ 15.531481_ 15.531481_ 15.663073_ 15.663681_ 15.663681_ 15.663681_ 15.666291_ 15.666291_ 15.666211_ 15.686231_ 15.686231_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 32834 32834 66 32834 66 32834 66 32834 66 32834 66 66 32834 66 66 32834 66 70	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-92766 TSval-3201163551 TSccr-3201163551 34154 + 5080 [ACK] Seq-25 Ack-49803719 Win-652766 Len-92766 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 [TCP Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163551 [TCP Dup ACK 30841] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163581 [TCP Dup ACK 30841] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163581 TSccr-3201163581 [TCP Vindow Update] 5080 + 34154 [ACK] Seq-25 Ack-5080255 Win-0 Len-0 TSval-3201163581 TSccr-3201163581 [TCP Vindow Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 TSval-3201163513 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 TSval-3201163614 TSccr-3201163581  [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Win-0 Len-0 TSval-3201163614 TSccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-3040255 Ack-25 Win-05536 Len-0 TSval-320116382 TSccr-320116382 TSccr-3201163614  [TCP Retransmission] 34154 + 5080 [PSH, ACK] Seq-3040255 Ack-25 Win-05536 Len-0 TSval-320116382 TSccr-320116382 TSccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-5114791 Win-48512 Len-0 TSval-320116382 TSccr-320116382 TSccr-320116382  5080 + 34154 [ACK] Seq-25 Ack-5114791 Win-48512 Len-0 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-25 Ack-514759 Win-65536 Len-02768 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-25 Ack-514759 Win-65536 Len-32768 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-25 Ack-514759 Win-65536 Len-32768 TSval-3201164050 TSccr-3201164182  [TCP Window Update] 5080 + 34154 [ACK] Seq-525 Ack-5180327 Win-65536 Len-02768 TSval-3201164050
385 386 387 388 399 392 393 394 397 397 498 491 492 493 494 494 495 497 498 499 411 411 411	14.871835_ 15.032398_ 15.032398_ 15.032444_ 15.061972_ 15.061972_ 15.061911_ 15.062012_ 15.062012_ 15.062012_ 15.094631_ 15.308659_ 15.308659_ 15.308683_ 15.308659_ 15.308681_ 15.308659_ 15.308681_ 15.531468_ 15.531468_ 15.531468_ 15.531468_ 15.636911_ 15.66621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.68621_ 15.686231_ 15.686231_ 15.686231_ 15.686231_ 15.686231_ 15.686231_ 15.686231_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 32834 78 32834 66 66 32834 32834 66 32834 66 32834 66 32834 66 66 63 32834 66 66 66 70 70	[TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4950951 Win-6536 Len-92766 TSval-3201163551 TSccr-3201163551 34154 + 5080 [ACK] Seq-25 Ack-4960951 Ack-25 Win-6536 Len-92766 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163551 TSccr-3201163551 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-4983719 Win-65536 Len-9 TSval-3201163581 TSccr-3201163551 [TCP Window Pull] [TCP Previous segment not captured] 34154 - 5080 [ACK] Seq-25 Ack-5080719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163551 TSccr-3201163561 [TCP Out-0f-Order] 34154 + 5080 [PSH, ACK] Seq-25 Ack-5040255 Winn-0 Len-0 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Winn-0 Len-0 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-25 Ack-5040255 Winn-6536 Len-0 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-5040255 Ack-5040255 Winn-6536 Len-0 TSval-3201163561 TSccr-3201163561 [TCP Window Update] 5080 + 34154 [ACK] Seq-5040255 Ack-5040255 Winn-6536 Len-32768 TSval-3201163828 TSccr-3201163828  TSccr-3201163624  [TCP Window Update] 5080 + 34154 [ACK] Seq-5040255 Winn-6536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSH, ACK] Seq-514759 Winn-6536 Len-0 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-514759 Winn-6536 Len-0 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-514759 Winn-6536 Len-032768 TSval-3201164050 TSccr-3201164050  34154 + 5080 [PSH, ACK] Seq-5180327 Winn-6536 Len-032768 TSval-3201164050  34154 + 5080 [PSH, ACK] Seq-5180327 Winn-6536 Len-32768 TSval-3201164050  34154 + 5080 [PSH, ACK] Seq-5180327 Ack-25 Winn-6536 Len-32768 TSval-3201164050  34154 + 5080 [PSH, ACK] Seq-5180327 Ack-25 Winn-6536 Len-32768 TSval-3201164050 TSccr-320116
385 386 388 389 390 390 391 392 393 395 396 399 480 481 482 483 484 485 486 487 488 489 481 481 481 481 481 481 481 481 481 481	14.871835_ 15.032398_ 15.032424_ 15.061972_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.094663_ 15.308683_ 15.308687_ 15.308687_ 15.308683_ 15.308683_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.68627_ 15.68627_ 15.68627_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 16.904898_ 16.904893_ 16.904893_ 16.904893_	127.0.0.1 127.0.0.1	127. 0.0.1 127. 0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 52834 78 32834 66 66 32834 66 32834 66 32834 66 32834 66 32834 66 66 32834 66 66 70 66	TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4950951 Win-65536 Len-92766 TSval-3201163551 TSccr-3201163551  34154 + 5080 (ACK) Seq-84509951 Ack-25 Win-65536 Len-92766 TSval-3201163551 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163551 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 Stc-3201163581 TSccr-3201163581  [TCP Dup ACK 34881  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 Stc-916487 SRE-5049255  [TCP Out-Of-Order] 34154 + 5080 [PSH, ACK) Seq-4983719 Ack-25 Win-65536 Len-32768 TSval-3201163581 TSccr-3201163581 TSccr-3201163581  [TCP Action of Window Update  5080 + 34154 (ACK) Seq-25 Ack-5049255 Win-65536 Len-0 TSval-3201163581 TSccr-3201163581 TSccr-3201163581  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5049255 Win-65536 Len-0 TSval-3201163614 TSccr-3201163614  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5049255 Min-65536 Len-0 TSval-3201163614 TSccr-3201163614  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5049255 Min-65536 Len-0 TSval-3201163614 TSccr-3201163614  [TCP Window Update  5080 PSH, ACK  Seq-5080223 Ack-25 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSH, ACK  Seq-25 Ack-5082023 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSH, ACK  Seq-5147599 Win-68512 Len-0 TSval-3201164950 TSccr-3201164950  34154 - 5080 [PSH, ACK  Seq-5147599 Win-68512 Len-0 TSval-3201164950 TSccr-3201164950  34154 + 5080 [PSH, ACK  Seq-5147599 Win-68512 Len-0 TSval-3201164950 TSccr-3201164950  34154 + 5080 [PSH, ACK  Seq-5147599 Win-68512 Len-0 TSval-3201164950 TSccr-3201164950  34154 + 5080 [PSH, ACK  Seq-5180327 Ack-25 Win-65536 Len-32768 TSval-3201164950 TSccr-3201164950  34154 + 5080 [PSH, ACK  Seq-524863 Ack-25 Win-65536 Len-32768 TSval-3201164950 TSccr-3201164950  34154 +
385 386 387 390 390 391 392 393 395 396 397 400 401 402 403 405 406 407 408 409 410 411 412 413 414 415	14.871835_ 15.032298_ 15.032244_ 15.032424_ 15.061972_ 15.061991_ 15.062091_ 15.062091_ 15.062091_ 15.094631_ 15.308683_ 15.308683_ 15.308683_ 15.531481_ 15.531481_ 15.63073_ 15.663073_ 15.663073_ 15.663673_ 15.663673_ 15.663673_ 15.663673_ 15.66373_ 15.66573_ 15.66573_ 15.66573_ 15.66573_ 16.96483_ 16.96483_ 16.96483_ 16.96483_	127.0.0.1 127.0.0.1	127.0.0.1 127.0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 32834 78 32834 66 32834 66 32834 66 32834 66 63 32834 66 66 70 66 66 66	TCP Window Update  5000 + 34154 [ACK] Seq-25 Ack-4950951 Win-65536 Len-0 TSval-3201163551 TSccr-3201163572   34154 + 5080 [ACK] Seq-4950951 Ack-25 Win-65536 Len-32768 TSval-3201163551 TSccr-3201163551   TSccr-3201163551
385 386 387 388 389 390 391 392 393 394 490 491 492 493 406 497 406 407 408 409 410 411 412 413 414 415	14.871835_ 15.032398_ 15.032424_ 15.061972_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.062612_ 15.094663_ 15.308683_ 15.308687_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.308683_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.531456_ 15.68627_ 15.68627_ 15.68627_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 15.68628_ 16.904898_ 16.904893_ 16.904893_ 16.904893_	127.0.0.1 127.0.0.1	127. 0.0.1 127. 0.0.1	TCP TCP TCP TCP TCP TCP TCP TCP TCP TCP	66 32834 66 66 32834 78 32834 32834 78 32834 66 32834 66 32834 66 32834 66 63 32834 66 66 70 66 66 66	TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4950951 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551  34154 + 5080 (ACK) Seq-86409931 Ack-25 Win-65536 Len-92768 TSval-3201163551 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163551 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163581  [TCP Dup ACK 34881  5080 + 34154 (ACK) Seq-25 Ack-4983719 Win-65536 Len-0 TSval-3201163581 TSccr-3201163551 TSccr-3201163581  [TCP Out-Of-Order] 34154 + 5080 [PSN, ACK) Seq-4983719 Ack-25 Win-65536 Len-0 32768 TSval-3201163581 TSccr-3201163581  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5040255 Win-65536 Len-0 TSval-3201163581 TSccr-3201163581  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5040255 Win-65536 Len-0 TSval-3201163581 TSccr-3201163581  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5040255 Win-65536 Len-0 TSval-3201163614 TSccr-3201163581  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5040255 Win-65536 Len-0 TSval-3201163614 TSccr-3201163828 TSccr-3201163814  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5040255 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828 TSccr-3201163814  [TCP Window Update  5080 + 34154 (ACK) Seq-25 Ack-5082023 Win-65536 Len-0 TSval-3201163828 TSccr-3201163828  34154 + 5080 [PSH, ACK) Seq-25 Ack-5147599 Win-648512 Len-0 TSval-3201164980 TSccr-320116490  34154 + 5080 [PSH, ACK) Seq-514791 Win-648512 Len-0 TSval-320116490 TSccr-320116490  34154 + 5080 [PSH, ACK) Seq-5147599 Win-648512 Len-0 TSval-320116490 TSccr-320116490  34154 + 5080 [PSH, ACK) Seq-5147599 Win-648512 Len-0 TSval-320116490 TSccr-320116490  34154 + 5080 [PSH, ACK) Seq-5147599 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSH, ACK) Seq-5180327 Ack-25 Win-65536 Len-32768 TSval-320116490 TSccr-320116490  34154 + 5080 [PSH, ACK) S

#### Zoom in:

Now we will see more packets that gets lost.

#### Open connection

```
74 34154 → 5080 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK_PERM TSval=3201148519 TSecr=0 WS=128

74 5080 → 34154 [SYN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TSval=3201148519 TSecr=3201148519 WS=128

66 34154 → 5080 [ACK] Seq=1 Ack=1 Win=65536 Len=0 TSval=3201148519 TSecr=3201148519
```

#### Lost packets:

"tcp previous segment not captured" is an expert message created by Wireshark when it didn't see a packet that should have been in the trace; this warning was previously called "tcp previous segment lost".

**Dup ACK** means that you capture at the source of the data (not the receiving side). That is quite normal if the packet loss occurs somewhere in the path to the receiver.

**TCP out-of-order** means that particular frame was received in a different order from which it was sent (after a later packet in the sequence). It is not generally a problem. It probably indicates there are multiple paths between source and destination - and one travels a through a longer path.

```
32834 [TCP Window Full] [TCP Previous segment not captured] 34154 → 5080 [ACK] Seq=65541 Ack=5 Win=65536 Len=32768 TSval=3201148547 TSecr=3201148547
78 [TCP Dup ACK 9#1] 5080 → 34154 [ACK] Seq=5 Ack=32773 Win=65536 Len=0 TSval=3201148547 TSecr=3201148520 SLE=65541 SRE=98309
32834 [TCP Out-Of-Order] 34154 → 5080 [PSH, ACK] Seq=32773 Ack=5 Win=65536 Len=32768 TSval=3201148547 TSecr=3201148547
```

**TCP Retransmission** occurs when the sender retransmits a packet after the expiration of the acknowledgement

396 15... 127... TCP 32834 [TCP Retransmission] 34154 → 5080 [PSH, ACK] Seq=5049255 Ack=25 Win=65536 Len=32768 TSval=3201163828 TSecr=3201163614

### Close connection lines 414, 415, 416

414 16 127 127 TCP	66 34154 → 5080 [FIN, ACK] Seq=5282605 Ack=25 Win=65536 Len=0 TSval=3201165424 TSecr=3201165424
415 16 127 127 TCP	66 5080 → 34154 [FIN, ACK] Seq=25 Ack=5282606 Win=65536 Len=0 TSval=3201165424 TSecr=3201165424
416 16 127 127 TCP	66 34154 → 5080 [ACK] Seg=5282606 Ack=26 Win=65536 Len=0 TSval=3201165424 TSecr=3201165424

## 2.1.3 15% lost

# open connection in lines 1 2

1 0.000 127.0	127.0.	TCP 74	46476 → 5080 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK PERM TSval=3201261410 TSecr=0 WS=128
2 1.010 127.0	127.0_	TCP 74	[TCP Retransmission] [TCP Port numbers reused] 46476 + 5080 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK_PERM TSVal=3201262421 TSecr=0 WS=128
3 1.010., 127.0	127.0	TCP 74	5080 + 46476 [SYN, ACK] Seq-0 Ack-1 Win-65483 Len-0 MSS-65495 SACK_PERM TSval-3201262421 TSecr-3201261410 WS-128
4 1.016 127.0	127.0_	TCP 74	[TCP Retransmission] 5080 + 46476 [5YN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TSval=3201262427 TSecr=3201261410 MS=128
5 1.016 127.0	127.0	TCP 66	46476 → 5080 [ACK] Seq=1 Ack=1 Win=65536 Len=0 TSval=3201262427 TSecr=3201262421
6 1.016 127.0	127.0_	TCP 66	[TCP Dup ACK 5#1] 46476 + 5080 [ACK] Seq=1 Ack=1 Win=65536 Len=0 TSval=3201262427 TSecr=3201262421
			46476 → 5080 [PSH, ACK] Seq=1 Ack=1 Win=65536 Len=4 TSval=3201262440 TSecr=3201262421
8 1.029 127.0			5080 + 46476 [ACK] Seq=1 Ack=5 Win=65536 Len=0 TSval=3201262440 TSecr=3201262440
9 1.030 127.0			5080 → 46476 [PSH, ACK] Seq=1 Ack=5 Win=65536 Len=4 TSval=3201262440 TSecr=3201262440
10 1.030 127.0			46476 → 5080 [ACK] Seq=5 Ack=5 Win=65536 Len=0 TSval=3201262441 TSecr=3201262440
11 1.033 127.0			46476 + 5080 [ACK] Seq-5 Ack-5 Win-65536 Len-32768 Tsval-3201262443 Tsecr-3201262440
12 1.033 127.0 13 1.034 127.0			TCP Window Full] 46476 + 5080 [PSH, ACK] Seq=32773 Ack=5 Win=65536 Len=32768 TSval=3201262443 TSecr=3201262440 [TCP ZeroNindow] 5080 + 46476 [ACK] Seq=5 Ack=65541 Win=0 Len=0 TSval=3201262444 TSecr=3201262443
13 1.034 127.0 14 1.082 127.0			[UV zerowiniow] 2000 # 40470 [EK] Selj=2 AC-60524 Milled Lefted 1930/1520/440   Sect=3201202403   [TOP Window Update] 5080 # 46467 [ACK] Selj=2 AC-605541 Win-48512 Left=0 TSV401-320120240   Sect=3201202403
15 1.082 127.0			[107 Million Operate] 3680 4 month [Million 2427 Million 2517 Million
16 1.120 127.0			5880 + 46476 [AcK] Seq=5 Ack=9839 Win=15744 Len=9 Tsval=3201262531 Tsecr=3201262493
17 1.182 127.0			[TCP Window Update] 5080 → 46476 [ACK] Seq=5 Ack=98309 Win=65536 Len=0 TSval=3201262592 TSecr=3201262493
18 1.182 127.0	2010/25/05/0		[TCP Window Full] [TCP Previous segment not captured] 46476 → 5080 [ACK] Seq=131077 Ack+5 Win-65536 Len=32768 TSval=3201262592 TSecr=3201262592
19 1.182 127.0			[TCP Dup ACK 16#1] 5080 + 46476 [ACK] Seq=5 Ack=98309 Win=65536 Len=0 TSval=3201262592 TSecr=3201262493 SLE=131077 SRE=163845
20 1.196 127.0			[TCP Retransmission] 46476 + 5080 [PSH, ACK] Seq=98309 Ack-5 Win=65536 Len=32768 TSval=3201262607 TSecr=3201262592
21 1.196 127.0			[TCP Zerowindow] 5080 → 46476 [ACK] Seq=5 Ack=163845 Win=0 Len=0 TSval=3201262607 TSecr=3201262607
22 1.227 127.0	127.0	TCP 66	[TCP Window Update] 5080 → 46476 [ACK] Seq=5 Ack=163845 Win=48512 Len=0 TSval=3201262638 TSecr=3201262607
23 1.227 127.0			46476 → 5080 [PSH, ACK] Seq=163845 Ack=5 Win=65536 Len=32768 TSval=3201262638 TSecr=3201262638
24 1,269 127.0			5080 + 46476 [ACK] Seq=5 Ack=196613 Win=15744 Len=0 TSval=3201262679 TSecr=3201262638
25 1.280 127.0			[TCP Window Update] 5080 → 46476 [ACK] Seq=5 Ack=196613 Win=65536 Len=0 TSval=3201262691 TSecr=3201262638
26 1.280 127.0			46476 + 5080 [ACK] Seq-196613 Ack=5 Win=65536 Len=32768 TSval=3201262691 TSecr=3201262691
27 2.225 127.0 28 2.225 127.0			[TCP Window Full] 46476 + 5080 [PSH, ACK] Seq=229381 ACk=5 Win=65536 Len=32708 TSval=3201263635 TSecr=3201262691  5080 + 46476 [ACK] Seq=5 Ack=262149 Win=48512 Len=0 TSval=3201263635 TSecr=3201263635
29 2.225 127.0			>000 + 404/0 [Act.] 5eq=> Act. act. act. act. act. act. act. act. a
30 2.225 127.0			Now1 + 7 1000 [Act.] 500-202139 Act-2 Wiln-15744 Len-0 TSVal-320220393 / 100-212020393
31 2.318 127.0			[TCP Window Update] 5080 + 46476 [ACK] 5eq=5 ACk=294917 Win=65536 Len=0 TSVal=3201263728 TSecr=3201263635
32 2.318 127.0			46476 + 5080 [PSH, ACK] Seq=294917 ACK=5 Win=65536 Len=32768 TSval=3201263728 TSecr=3201263728
33 2.318 127.0			[TCP Window Full] 46476 + 5080 [ACK] Seg-327685 Ack-5 Win-65536 Len-32768 TSval-3201263728 TSecr-3201263728
34 2.339 127.0	127.0	TCP 66	5080 + 46476 [ACK] Seq=5 Ack=360453 Win=48512 Len=0 TSval=3201263749 TSecr=3201263728
35 2.339 127.0	127.0	TCP 32834	46476 → 5080 [PSH, ACK] Seq=360453 Ack=5 Win=65536 Len=32768 TSval=3201263749 TSecr=3201263749
36 2.381 127.0	127.0	TCP 66	5080 + 46476 [ACK] Seq=5 Ack=393221 Win=65536 Len=0 TSval=3201263792 TSecr=3201263749
37 2.381 127.0			46476 → 5080 [ACK] Seq=393221 Ack=5 Win=65536 Len=32768 TSval=3201263792 TSecr=3201263792
38 2.381 127.0			[TCP Window Full] 46476 → 5080 [PSH, ACK] Seq=425989 Ack=5 Win=65536 Len=32768 TSval=3201263792 TSecr=3201263792
39 2.381 127.0			[TCP ZeroNindow] 5080 + 46476 [ACK] Seq-5 Ack-458757 Win=0 Len=0 TSval=3201263792 TSecr=3201263792
40 2.402 127.0			[TCP Window Update] 5080 + 46476 [ACK] Seq=5 Ack=458757 Win=48512 Len=0 TSval=3201263812 TSecr=3201263792
41 2.402 127.0			46476 + 5080 [ACK] Seq=458757 Ack=5 Win=65536 Len=32768 TSval=3201263812 TSecr=3201263812  5080 + 46476 [ACK] Seq=5 Ack=491525 Win=65536 Len=0 TSval=3201263873 TSecr=3201263812
42 2.463 127.0			5980 + 40470 [ACK] Seq=5 ACK-493122 MITHO503D LENEN TSVAI=320125873 TSCCT=3201258812 46476 + 5986 [PSH, ACK] Seq=491525 ACK-5 MITHO503D LENEN TSVAI=3201258973 TSCCT=3201268873
44 2.463 127.0			4004.0 + 2000 [PSH, AKE] SQC=254293 AKE-5 WINF05230 LENF-34/10 [EVAL=2401.05873 [SCC=2504.05873] 464676 + 5000 [PSH, AKE] SQC=254293 AKE-5 WINF05250 LENF-3970 [EVAL=2401.05873] 5000 [PSH, AKE] SQC=254293 AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] AKE-5 WINF05250 [ENF-3970 [EVAL=2401.05873] [SCC=25420] [S
45 2.463 127.0			5080 + 4047 [AKK] 50g-34829 AKK-9 381-0539 AIN-9 391-201263873 [See-230120307]
46 2.693 127.0			5080 + 46476 [PSH, ACK] Seq=5 ACK=528263 Win=65536 Len=4 TSval=3201264104 TSecr=3201263873
47 2.694 127.0		.500	[TCP Window Full] [TCP Previous segment not captured] 46476 → 5080 [PSH, ACK] Seq=561031 Ack=9 Win=65536 Len=32768 TSval=3201264104 TSecr=3201264104
48 2.694 127.0			[TCP Dup ACK 45#1] 5080 + 46476 [ACK] Seq=9 Ack=528263 Win=65536 Len=0 TSval=3201264105 TSecr=3201263873 SLE=561031 SRE=593799
49 2.694 127.0			[TCP Out-Of-Order] 46476 + 5080 [ACK] Seq=528263 Ack=9 Win=65536 Len=32768 TSval=3201264105 TSecr=3201264105
50 2.694 127.0			[TCP ZeroWindow] 5080 + 46476 [ACK] Seq=9 Ack=593799 Win=0 Len=0 TSval=3201264105 TSecr=3201264105
51 2.731 127.0	127.0	TCP 66	[TCP Window Update] 5080 + 46476 [ACK] Seq=9 Ack=593799 Win=48512 Len=0 TSval=3201264141 TSecr=3201264105
52 2.731 127.0			46476 + 5080 [ACK] Seq=593799 Ack=9 Win=65536 Len=32768 TSval=3201264141 TSecr=3201264141
53 2.773 127.0	127.0	TCP 66	5080 → 46476 [ACK] Seq=9 Ack=626567 Win=15744 Len=0 TSVal=3201264184 TSecr=3201264141

# Close the connection in lines 256, 257, 258

| 203 13.0176. 127.0.0. 127.0.0. TCP 65549 46476 F088 [ACK] Seq=3763306 Ack=21 Win-65536 Len-65483 TSval=3201274428 TSecr=3201274427 [TSecr=3201274427 Stecr=3201274427 Stecr=3201274428 TSecr=3201274428                  |
|--|----------------------|
| 205 13.0179. 127.0.0. 1CP 65549 [TCP Previous segment not captured] 46476 + 5080 [ACK] Seq-3894272 Ack-21 Win-65536 Len-65483 Tsval=3201274428 Tsecr-3201274428 | 228                  |
| 205 13.0179 127.0.0. 127.0.0. 1CP 65549 46476 + 5080 [ACK] Seq-3959755 Ack-21 Win-65536 Len-65483 TSval=3201274428 TSecr=3201274428 TSecr=32   | 128                  |
| 207 13.0180. 127.0.0. 127.0.0. 127.0.0. 1CP 78 [TCP Dup ACK 204#1] 5880 + 46476 [ACK] Seq-21 Ack-3828789 Win-1964032 Len-0 TSval-3201274428 TSecr-3201274428 TS |                      |
| 208 13.018&. 127.0.0 127.0.0 TCP 65549 46476 + 5080 [ACK] Seq=4025238 Ack=21 Win=65536 Len=65483 TSval=3201274428 TSecr=3201274428 TSecr=3201274428 TSecr=3201274428 TSecr=3201274428 TSecr=3201274427 SLE=3894272 SREED   |                      |
| 289 13.0188 127.0.0 1CP 78 [TCP Dup ACK 204#2] 5880 → 46476 [ACK] Seq-21 Ack-3828789 Win-1964032 Len-0 TSval-3201274428 TSecr-3201274428       | <del>-</del> 3959755 |
| 210 13.0180… 127.0.0… 127.0.0… TCP 65549 46476 → 5080 [ACK] Seq-4099721 Ack-21 Win-65536 Len-65483 TSval=3201274428 TSecr=3201274428   |                      |
|  | <del>-</del> 4025238 |
|  |                      |
| 211 13.0180 127.0.0 127.0.0 1CP 78 [TCP Dup ACK 204#3] 5080 + 46476 [ACK] Seq=21 Ack=3828789 Win=1964032 Len=0 TSval=3201274428 TSecr=3201274427 SLE=3894272 SRI   | =4090721             |
| 212 13.0181 127.0.0 1CP 65549 [TCP Fast Retransmission] 46476 → 5080 [ACK] Seq=3828789 Ack-21 Win-65536 Len-65483 TSval-3201274428 TSecr-3201274428  |                      |
| 213 13.0184… 127.0.0 127.0.0 TCP 66 5080 → 46476 [ACK] Seq=21 Ack=4156204 Win=1636736 Len=0 TSval=3201274428 TSecr=3201274428  |                      |
| 214 13.0184 127.0.0 127.0.0 TCP 65549 46476 → 5080 [ACK] Seq~4156204 Ack~21 Win-65536 Len-65483 TSval-3201274429 TSecr~3201274428  |                      |
| 215 13.0184_ 127.0.0_ 127.0.0_ TCP 4460 46476 + 5080 [PSH, ACK] Seq-4221687 Ack=21 Win=65536 Len=4394 TSval=3201274429 TSecr=3201274428  |                      |
| 216 13.0444. 127.0.0. 127.0.0. TCP 4460 [TCP Retranssission] 46476 - 5080 [PSH, ACK] Seq-#4221687 Ack-21 Min-65536 Len-#394 TSval-3201274455 TSecr-3201274428 177 13.2496. 127.0 8. 127.0 8. TCP 65549 [TCP Retranssission] 46476 - 5080 [ACK] Seq-#4150204 Ack-21 Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [ACK] Seq-#4150204 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [ACK] Seq-#4150204 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [ACK] Seq-#4150204 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 Len-#394 TSval-3201274458 [TCP Retranssission] 46476 - 5080 [Min-65536 [TCP Retranssission] 46476 [TCP Retranssission] 46476 [TCP Retranssission] 46476 [TCP R |                      |
|  |                      |
| 218 13.2490. 127.0.0. 127.0.0. TCP 78 5080 + 46476 [ACK] Seq=21 Ack=4226081 Win=1798144 Len=0 TSval=3201274659 TSecr=3201274455 SLE-4156204 SRE-4221687  |                      |
| 219 14.7118. 127.0.0. 127.0.0. TCP 70 46476 + 5080 [PsH, ACK] Seq-4226081 Ack-21 Min-65536 Len-4 TSval=3201276122 TSecr=3201274659   |                      |
| 220 14.7118. 127.0.0. 127.0.0. TCP 66 5888 + 464F. [ACK] Seg-21 Ack-4226885 Win-2028932 Len-0 TSval=3201276122 Tsecr=3201276122  |                      |
| 221 14.7121. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-4226005 Ack-21 Win-65536 Len-65483 TSval-3-201276122 TSecr-3201276122  |                      |
| 222 14.7121 127.0.0 127.0.0 TCP 66 5080 + 46476 [ACK] Seq=21 Ack=4291568 Win=1997440 Len=0 TSval=3201276122 TSecr=3201276122   |                      |
| 223 14.7121. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-4291568 Ack-21 Win-65536 Len-65483 TSval-3-201276122 TSecr-3201276122  |                      |
| 224 14.7123 127.0.0 127.0.0 TCP 66 5080 + 46476 [ACK] Seq=21 Ack=4357051 Win=1964672 Len=0 TSval=3201276122 TSecr=3201276122   |                      |
| 225 14.7123. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-4357051 Ack-21 Win-65536 Len-65483 TSval-3-201276122   |                      |
| 226 14.7123. 127.0.0. 127.0.0. TCP 66 5080 + 46476 [ACK] Seq-21 Ack-4422534 Win-1932032 Len-0 TSval-3201276123 TSecr-3201276123  |                      |
| 227 14.7124. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-4422534 Ack-21 Win-65536 Len-65483 TSval-3201276123 TSecr-3201276122   |                      |
| 228 14.7125. 127.0.0. 127.0.0. TCP 66 5080 + 46476 [ACK] Seq-21 Ack-4488017 Win-1899264 Len-0 TSval-3201276123 TSecr-3201276123  |                      |
| 229 14.7125 127.0.0 TCP 65549 46476 → 5080 [ACK] Seq=4488017 Ack=21 Win=65536 Len=65483 TSval=3201276123 TSecr=3201276122<br>230 14.7125 127.0.0 TCP 65549 [TCP Previous segment not captured] 46476 → 5080 [ACK] Seq=4618983 Ack=21 Win=65536 Len=65483 TSval=3201276123 TSecr=3201276123 T            | 22                   |
| 230 14.7125 127.0.0 127.0.0 TCP 65549 [TCP Previous segment not captured] 46476 → 5080 [ACK] Seq-4618983 Ack=21 Win-65536 Len=65483 TSval=3201276123 TSecr=32012766 231 14.7125 127.0.0 127.0.0 TCP 78 5080 → 46476 [ACK] Seq=21 Ack=4553500 Win=1866496 Len=0 TSval=3201276123 TSecr=3201276123 SLE=4618983 SRE=46884466  | .23                  |
| 231 14-7125. 127-0.0. 127-0.0. 170 5554 94676 5808 [Seq-684666.6-kc-2] Min-50536 [en-6583] Stud-102076127 [Sec-2-20127612] Sec-2-201276123   |                      |
| 233 14.712. 127.0.0. 127.0.0. TCP 4460 4676 +5880 [EN], ACK] Sea-479999 Ack=21 Min-65536 Lent-1963/2161213 Test-2301276123   |                      |
| 234 14.7126. 127.0.0. 127.0.0. TCP 78 [TC Du DAX 2316] 5889 4 46475 [AK] 562-21 Ack-4553508 hir-186495 [Ack-555308 hir-186495] 5880 5880 5880 5880 5880 5880 5880 58   | -4749949             |
| 235 14.7126. 127.0.0. 127.0.0. TCP 65549 [TCP Out-0f-Onder] 46476 - 5080 [ACK] Seq.4553500 Ack-21 Min-65536 Len-55483 Tsval-2301276123 Tsecr-23201276123   |                      |
| 236 14.7126. 127.0.0. 127.0.0. 1CP 78 TCP Dup ACK 231#2  5080 + 46476 [ACK] Seq=21 Ack=4553500 Win=1866496 Len=0 T5val=3201276123 Tsecr=3201276123 SLE=4618983 SRI   | =4754343             |
| 237 14.7126. 127.0.0. 127.0.0. TCP 66 5888 + 46476 [ACK] Seg=21 Ack=4754343 Win=1655664 Len=0 TSval=3201276123 TSecr=3201276123  | . 4754545            |
| 238 15.2343. 127.0.0 127.0.0 TCP 70 5080 + 46476 [PSH, ACK] Seq=21 Ack=4754343 Win=2028032 Len=4 TSval=3201276644 TSecr=3201276123   |                      |
| 239 15.2350. 127.0.0. 127.0.0. TCP 65549 46476 * 5080 [ACK] Seq-4754343 Ack-25 Win-65536 Len-65483 TSval-3201276645 TSecr-3201276644   |                      |
| 240 15.2350. 127.0.0. 127.0.0. TCP 66 5080 + 46476 [ACK] Seq-25 Ack-4819826 Win-1997440 Lene0 TSval=3201276645 TSecr=3201276645  |                      |
| 241 15.2357 127.0.0 127.0.0 TCP 65549 46476 → 5080 [ACK] Seg-4819826 Ack-25 Win-65536 Len-65483 TSval-3201276646 TSecr-3201276644  |                      |
| 242 15.2359. 127.0.0 127.0.0 TCP 66 5888 + 46476 [AKK] Seq-25 Ack-4885309 Min-1964032 Len-0 TSval=3201276646 TSecr=3201276646  |                      |
| 243 15.2361_ 127.0.0_ 127.0.0_ TCP 65549 46476 + 5080 [ACK] Seq-4885309 Ack-25 Win=65536 Len=65483 TSval=3201276646 TSecr=3201276645   |                      |
| 244 15.2362. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-4950792 Ack-25 Win-65536 Len-65483 TSval=3201276646 TSecr=3201276645   |                      |
| 245 15.2362. 127.0.0. 127.0.0. TCP 66 5080 + 46476 [ACK] Seq=25 Ack=5016275 Win=1897344 Len=0 TSval=3201276646 TSecr=3201276646  |                      |
| 246 15.2363. 127.0.0. 127.0.0. TCP 65549 46476 → 5080 [ACK] Seq-5016275 Ack-25 Win-65536 Len-65483 TSval=3201276646 TSecr=3201276646   |                      |
| 247 15.2363. 127.0.0. 127.0.0. TCP 65549 46476 + 5080 [ACK] Seq=5081758 Ack=25 Win=65536 Len=65483 TSval=3201276646 TSecr=3201276646   |                      |
| 248 15.2363. 127.0.0. 127.0.0. TCP 66 5080 → 46476 [ACK] Seg-25 Ack-5081758 Win-1831936 Len-0 TSval-3201276646 TSecr-3201276646  |                      |
| 249 15.2363. 127.0.0. 127.0.0. TCP 66 5080 + 46476 [ACK] Seq=25 Ack=5147241 Win=1798528 Len=0 TSval=3201276646 TSecr=3201276646  |                      |
| 250 15.2365 127.0.0 127.0.0 TCP 4460 [TCP Previous segment not captured] 46476 - 5080 [PSH, ACK] Seq-5278207 Ack-25 Win-65536 Len-4394 TSval-3201276646 TSecr-320:   | .276646              |
| 251 15.2365 127.0.0 127.0.0 TCP 78 [TCP Dup ACK 249#1] 5980 - 46476 [ACK] Seq-25 Ack-5147241 Min-1798528 Len-0 TSval-3201276647 TSecr-3201276646 SLE-5278207 SRI   |                      |
| 252 15.2365 127.0.0 127.0.0 TCP 65549 [TCP Out-Of-Order] 46476 - 5080 [ACK] Seq=5147241 Ack-25 Win=65536 Len=65483 TSval=3201276647 TSecr=3201276647   |                      |
| 253 15.2365 127.0.0 127.0.0 TCP 78 5080 + 46476 [ACK] Seq-25 Ack-5212724 Win-1733120 Len-0 TSval-3201276647 TSecr-3201276647 SLE-5278207 SRE-5282601   |                      |
| 254 15.2366 127.0.0 127.0.0 TCP 65549 [TCP Out-Of-Order] 46476 + 5080 [ACK] Seg=5212724 Ack=25 Win=65536 Len=65483 TSval=3201276647 TSecr=3201276647   |                      |
| 255 15.2367_ 127.0.0_ 127.0.0_ TCP 66 5080 → 46476 [ACK] Seq=25 Ack=5282601 Win=1663360 Len=0 TSval=3201276647 TSecr=3201276647  |                      |
| 256 17.1930 127.0.0 1CP 70 46476 + 5080 [FIN, PSH, ACK] Seq=5282601 Ack=25 Win=65536 Len=4 TSval=3201278603 TSecr=3201276647   |                      |
| 257 17.1933 127.0.0 127.0.0 TCP 66 5080 → 46476 [FIN, ACK] Seq-25 Ack-5282606 Win-2028032 Len-0 TSval-3201278603 TSecr-3201278603  |                      |
| 258 17.1933 127.0.0 127.0.0 TCP 66 46476 → 5080 [ACK] Seq=5282606 Ack=26 Win=65536 Len=0 TSval=3201278603 TSecr=3201278603   |                      |

## Here we can see one more problem that accrue:

**TCP Fast Retransmission** occurs when the sender retransmits a packet before the expiration of the acknowledgement timer

212 13... 127... 127... TCP 65549 [TCP Fast Retransmission] 46476 → 5080 [ACK] Seq=3828789 Ack=21 Win=65536 Len=65483 TSval=3201274428 TSecr=3201274428

# 2.1.4 20% lost

# open connection in lines 1 2

1 0.00	127	127	TCP	74 58890 + 5080 [SYN] Seq=0 Win=65495 Len=0 MSS=65495 SACK PERM TSVal=3201356783 TSecr=0 WS=128
2 0.00				74 5080 + 58890 [5YN, ACK] Seq=0 Ack=1 Win=65483 Len=0 MSS=65495 SACK_PERM TSval=3201356783 TSecr=3201356783 WS=128
3 0.00				66 58890 + 5080 [ACK] Seq-1 Ack-1 Win-65536 Len-0 TSval-3201356783 TSecr-3201356783
4 0.00				70 58890 - 5080 [PSH, ACK] Seq=1 Ack=1 Min=65536 Len=4 TSVal=3201356784 TSecr=3201356783
5 0.00				66 5080 + 58890 [ACK] Seq=1 Ack=5 Win=65536 Len=0 TSval=3201356784 TSecr=3201356784
6 0.00				70 5080 + 58890 [PSH, ACK] Seq=1 Ack=5 Win=65536 Len=4 TSVal=3201356784 TSecr=3201356784
7 0.00				66 58899 + 5080 [ACK] Seq=5 Ack=5 Win=65536 Len=0 TSval=3201356784 TSecr=3201356784
8 0.00				32834 58890 - 5080 [ACK] Seq=5 Ack=5 Win=65536 Len=32768 TSval=3201356784 TSecr=3201356784
9 0.02				32834 [TCP Window Full] 5899 + 5989 [P5H, ACK] Seq=32773 Acks Win=55536 Len=32768 TSval=3201356808 TSecr=3201356784
10 0.02				66 [TCP ZeroMindow] 5080 - \$8890 [ACK] Seq=5 Ack=65541 Win=0 Len=0 TSval=3201356808 TSecr=3201356794
11 0.03			1000	66 [TCP Window Update] 5980 + 58890 [ACK] Seq=5 Ack=65541 Win=48512 Len=0 TSval=3201356816 TSecr=3201356784
12 0.03				32834 58890 → 5989 [ACK] Seg=65541 Ack=5 Win=65536 Len=32768 TSval=3201356816 TSecr=3201356816
13 0.11_				66 5080 → 58890 [AcK] Seq=5 Ack=98309 Win=65536 Len=0 TSval=3201356898 TSecr=3201356816
14 0.11_				32834 58890 → 5980 [PSH, ACK] Seq=98309 Ack=5 Win=65536 Len=32768 TSval=3201356898 TSecr=3201356898
15 0.11			110000	32834 [TCP Window Full] 58890 + 5980 [ACK] Seg=131077 Ack=5 Win=65536 Len=32768 TSvzl=3201356898 TSecr=3201356898
16 0.11_				66 [TCP ZeroWindow] 5080 → 58890 [ACK] Seq=5 Ack=163845 Win=0 Len=0 TSval=3201356898 TSecr=3201356898
17 0.15				66 [TCP Window Update] 5880 → 58890 [ACK] Seq=5 Ack=163845 Win=48512 Len=0 TSval=3201356934 TSecr=3201356898
18 0.15				32834 \$8890 → 5080 [PSH, ACK] Seq=163845 Ack=5 Win=65536 Len=32768 TSval=3201356934 TSecr=3201356934
19 0.19	127	127	TCP	66 5080 → 58890 [ACK] Seg=5 Ack=196613 Win=15744 Len=0 TSval=3201356979 TSecr=3201356934
20 0.20				66 [TCP Window Update] 5880 → 58890 [ACK] Seq=5 Ack=196613 Win=65536 Len=0 TSval=3201356988 TSecr=3201356934
21 0.20				32834 58890 → 5880 [ACK] Seg=196613 ACk⇒5 Win=65536 Len=32768 TSval=3201356989 TSecr=3201356988
22 0.20	127	127	TCP	32834 [TCP Window Full] 58890 → 5080 [PSH, ACK] Seg≈229381 Ack=5 Win=65536 Len=32768 TSval=3201356989 TSecr≈3201356988
23 0.20				66 [TCP ZeroWindow] 5080 → 58890 [ACK] Seq=5 Ack=262149 Win=0 Len=0 TSval=3201356989 TSecr=3201356989
24 0.23				66 [TCP Window Update] 5080 + 58890 [ACK] Seq=5 Ack=262149 Win=48512 Len=0 TSval=3201357018 TSecr=3201356989
25 0.23	127	127	TCP	32834 58890 → 5080 [ACK] Seg=262149 Ack=5 Win=65536 Len=32768 TSval=3201357018 TSecr=3201357018
26 0.27	127	127	TCP	66 5080 → 58890 [ACK] Seq=5 Ack=294917 Win=15744 Len=0 TSval=3201357057 TSecr=3201357018
27 0.49	127	127	TCP	15810 [TCP Window Full] 58890 → 5080 [PSH, ACK] Seq=294917 Ack=5 Win=65536 Len=15744 TSval=3201357282 TSecr=3201357057
28 0.49	127	127	TCP	66 5080 + 58890 [ACK] Seg=5 Ack=310661 Win=57088 Len=0 TSval=3201357283 TSecr=3201357282
29 0.49	127	127	TCP	17090 58890 → 5080 [PSH, ACK] Seq=310661 Ack=5 Win=65536 Len=17024 TSval=3201357283 TSecr=3201357283
30 0.49	127	127	TCP	32834 58890 → 5080 [ACK] Seq=327685 Ack=5 Win=65536 Len=32768 TSval=3201357283 TSecr=3201357283
31 0.49	127	127	TCP	66 5080 → 58890 [ACK] Seq=5 Ack=360453 Win=7296 Len=0 TSval=3201357283 TSecr=3201357283
32 0.64	127	127	TCP	66 [TCP Window Update] 5080 → 58890 [ACK] Seq=5 Ack=360453 Win=65536 Len=0 TSval=3201357428 TSecr=3201357283
33 0.64	127	127	TCP	32834 58890 → 5080 [PSH, ACK] Seq=360453 Ack=5 Win=65536 Len=32768 TSval=3201357428 TSecr=3201357428
34 0.66	127	127	TCP	66 5080 → 58890 [ACK] Seq=5 Ack=393221 Win=65536 Len=0 TSval=3201357450 TSecr=3201357428
35 0.66	127	127	TCP	32834 [TCP Window Full] [TCP Previous segment not captured] 58890 + 5080 [PSH, ACK] Seq=425989 Ack=5 Win=65536 Len=32768 TSval=3201357450 TSecr=3201357450
36 0.66				78 [TCP Dup ACK 34#1] 5080 → 58890 [ACK] Seq=5 Ack=393221 Win=65536 Len=0 TSval=3201357450 TSecr=3201357428 SLE=425989 SRE=458757
37 0.66				32834 [TCP Retransmission] 58890 + 5080 [ACK] Seq=393221 Ack=5 Win=65536 Len=32768 TSval=3201357451 TSecr=3201357450
38 0.66				66 [TCP ZeroWindow] 5080 → 58890 [ACK] Seq=5 Ack=458757 Win=0 Len=0 TSval=3201357451 TSecr=3201357451
39 0.69	127	127	TCP	66 [TCP Window Update] 5880 + 58890 [ACK] Seq=5 Ack=458757 Win=48512 Len=0 TSval=3201357478 TSecr=3201357451
40 0.69_	127	127	TCP	32834 58890 → 5080 [ACK] Seq=458757 Ack=5 Win=65536 Len=32768 TSval=3201357478 TSecr=3201357478
41 0.73	127	127	TCP	66 5080 → 58890 [ACK] Seq=5 Ack=491525 Win=15744 Len=0 TSval=3201357519 TSecr=3201357478
42 0.73	127	127	TCP	66 [TCP Window Update] 5880 → 58890 [ACK] Seq=5 Ack=491525 Win=65536 Len=0 TSval=3201357521 TSecr=3201357478
43 0.78_	127	127	TCP	4036 [TCP Previous segment not captured] 58890 + 5080 [PSH, ACK] Seq=524293 Ack=5 Win=65536 Len=3970 TSval=3201357564 TSecr=3201357521
44 0.78				78 [TCP Dup ACK 41#1] 5080 → 58890 [ACK] Seq=5 Ack=491525 Win=65536 Len=0 TSval=3201357564 TSecr=3201357478 SLE=524293 SRE=528263
45 0.78				32834 [TCP Retransmission] 58890 → 5080 [PSH, ACK] Seq=491525 Ack=5 Win=65536 Len=32768 TSval=3201357564 TSecr=3201357564
46 0.78	127	127	TCP	66 5080 → 58890 [ACK] Seq=5 Ack=528263 Win=45952 Len=0 TSval=3201357564 TSecr=3201357564
47 1.03	127	127	TCP	70 5080 → 58890 [PSH, ACK] Seq=5 Ack=528263 Win=65536 Len=4 TSval=3201357816 TSecr=3201357564
48 1.03	127	127	TCP	32834 58890 → 5080 [ACK] Seq=528263 Ack=9 Win=65536 Len=32768 TSval=3201357816 TSecr=3201357816
49 1.03				66 5080 → 58890 [ACK] Seq=9 Ack=561031 Win=48512 Len=0 TSval=3201357816 TSecr=3201357816
FA 1 A3	127	127	TCD	23034 FRREE - FRRE FREE AND CLUSTERS AND MELLERFACE FLUI-23768 TRUIT-23363FRREE TRUIT-23363FRREE

# Close the connection in lines 342, 343, 344

299 34	1.3	127	127	TCP	65549	58890 → 5080 [	ACK]	Seq=4156204 Ack=21 Win=65536 Len=65483 TSval=3201391096 TSecr=3201391096
300 34	1.3	127	127	TCP	66	5080 + 58890 [A	ACK]	Seq=21 Ack=4156204 Win=2223616 Len=0 TSval=3201391096 TSecr=3201391096
301 34	1.3	127	127	TCP	66	5080 → 58890 [A	ACK]	Seq=21 Ack=4221687 Win=2224256 Len=0 TSval=3201391096 TSecr=3201391096
302 34	1.5	127	127	TCP	4460	58890 → 5080 [I	PSH,	ACK] Seq=4221687 Ack=21 Win=65536 Len=4394 TSval=3201391367 TSecr=3201391096
303 34	1.8	127	127	TCP	4460	[TCP Retransmi:	ssio	n] 58890 → 5080 [PSH, ACK] Seq=4221687 Ack=21 Win=65536 Len=4394 TSval=3201391615 TSecr=3201391096
304 35					4460	[TCP Retransmi:		n] 58890 → 5080 [PSH, ACK] Seq=4221687 Ack=21 Win=65536 Len=4394 TSval=3201392112 TSecr=3201391096
305 35	5.3	127	127	TCP	78	5080 → 58890 [A	ACK]	Seq=21 Ack=4226081 Win=2355584 Len=0 TSval=3201392112 TSecr=3201392112 SLE=4221687 SRE=4226081
306 37	7.1	127	127	TCP	70	58890 → 5080 [I	PSH,	ACK] Seq=4226081 Ack=21 Win=65536 Len=4 TSval=3201393980 TSecr=3201392112
307 37	7.1	127	127	TCP	66	5080 → 58890 [A	ACK]	Seq=21 Ack=4226085 Win=2355584 Len=0 TSval=3201393980 TSecr=3201393980
308 37	7.1	127	127	TCP	65549	58890 ÷ 5080 [	ACK]	Seq=4226085 Ack=21 Win=65536 Len=65483 TSval=3201393980 TSecr=3201393980
309 37	7.1	127	127	TCP	66	5080 → 58890 [A	ACK]	Seq=21 Ack=4291568 Win=2456064 Len=0 TSval=3201393980 TSecr=3201393980
310 37	7.2	127	127	TCP	65549	[TCP Previous	segm	ent not captured] 58890 → 5080 [ACK] Seq=4422534 Ack=21 Win=65536 Len=65483 TSval=3201394032 TSecr=3201393980
311 37							09#1	] 5080 → 58890 [ACK] Seq=21 Ack=4291568 Win=2456064 Len=0 TSval=3201394032 TSecr=3201393980 SLE=4422534 SRE=4488017
312 37					65549			n] 58890 + 5080 [ACK] Seq=4291568 Ack=21 Win=65536 Len=65483 TSval=3201394032 TSecr=3201394032
313 37	7.2	127	127	TCP	78	5080 + 58890 [A	ACK]	Seq=21 Ack=4357051 Win=2422656 Len=0 TSval=3201394032 TSecr=3201394032 SLE=4422534 SRE=4488017
314 37	7.2	127	127	TCP	65549	58890 → 5080 [A	ACK]	Seq=4488017 Ack=21 Win=65536 Len=65483 TSval=3201394032 TSecr=3201394032
315 37	7.4	127	127	TCP	65549	[TCP Retransmi	ssio	n] 58890 → 5080 [ACK] Seq=4357051 Ack=21 Win=65536 Len=65483 TSval=3201394259 TSecr=3201394032
316 38	3.8				65549	[TCP Retransmi		n] 58890 → 5080 [ACK] Seq=4357051 Ack=21 Win=65536 Len=65483 TSval=3201395665 TSecr=3201394032
317 40	7				65549			n] 58890 → 5080 [ACK] Seq=4357051 Ack=21 Win=65536 Len=65483 TSval=3201397491 TSecr=3201394032
318 40	7	127	127	TCP	78	5080 → 58890 [A	ACK]	Seq=21 Ack=4553500 Win=2489472 Len=0 TSval=3201397492 TSecr=3201394259 SLE=4357051 SRE=4422534
319 40	9.7	127	127	TCP	65549	58890 → 5080 [A	ACK]	Seq=4553500 Ack=21 Win=65536 Len=65483 TSval=3201397492 TSecr=3201397492
320 40	7	127	127	TCP	65549	[TCP Previous :	segm	ent not captured] 58890 → 5080 [ACK] Seq=4684466 Ack=21 Win=65536 Len=65483 TSval=3201397492 TSecr=3201397492
321 40	7	127	127	TCP	78	5080 → 58890 [A	ACK]	Seq=21 Ack=4618983 Win=2456064 Len=0 TSval=3201397492 TSecr=3201397492 SLE=4684466 SRE=4749949
322 40	7.7	127	127	TCP	4460	58890 → 5080 [I	PSH,	ACK] Seq=4749949 Ack=21 Win=65536 Len=4394 TSval=3201397492 TSecr=3201397492
323 40	7	127	127	TCP	78	[TCP Dup ACK 3:	21#1	] 5080 → 58890 [ACK] Seq=21 Ack=4618983 Win=2456064 Len=0 TSval=3201397492 TSecr=3201397492 SLE=4684466 SRE=4754343
324 40	7							n] 58890 → 5080 [ACK] Seq=4618983 Ack=21 Win=65536 Len=65483 TSval=3201397492 TSecr=3201397492
325 40	7	127	127	TCP	66	5080 → 58890 [A	ACK]	Seq=21 Ack=4754343 Win=2388352 Len=0 TSval=3201397492 TSecr=3201397492
326 40	9.8	127	127	TCP	70	5080 → 58890 [I	PSH,	ACK] Seq=21 Ack=4754343 Win=2489472 Len=4 TSval=3201397653 TSecr=3201397492
327 40	.8	127	127	TCP	65549	58890 → 5080 [A	ACK]	Seq=4754343 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
328 40	.8	127	127	TCP	65549	58890 → 5080 [A	ACK]	Seq=4819826 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
329 40	.8	127	127	TCP	66	5080 → 58890 [/	ACK]	Seq=25 Ack=4885309 Win=2422656 Len=0 TSval=3201397653 TSecr=3201397653
330 40	.8	127	127	TCP	65549	58890 → 5080 [/	ACK]	Seq=4885309 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
331 40	.8	127	127	TCP	66	5080 + 58890 [A	ACK]	Seq=25 Ack=4950792 Win=2389888 Len=0 TSval=3201397653 TSecr=3201397653
332 40	.8	127	127	TCP	65549	58890 → 5080 [A	ACK]	Seq=4950792 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
333 40	.8	127	127	TCP	65549	58890 + 5080 [A	ACK]	Seq=5016275 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
334 40	.8	127	127	TCP	66	5080 + 58890 [A	ACK]	Seq=25 Ack=5081758 Win=2324480 Len=0 TSval=3201397653 TSecr=3201397653
335 40	8	127	127	TCP	65549	[TCP Previous :	segm	ent not captured] 58890 + 5080 [ACK] Seq=5147241 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
336 40	8						34#1	] 5080 → 58890 [ACK] Seq=25 Ack=5081758 Win=2324480 Len=0 TSval=3201397653 TSecr=3201397653 SLE=5147241 SRE=5212724
337 40	.8	127	127	TCP	65549	58890 → 5080 [/	ACK]	Seq=5212724 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
338 40	8	127	127	TCP	78	[TCP Dup ACK 3	34#2	] 5080 → 58890 [ACK] Seq=25 Ack=5081758 Win=2324480 Len=0 TSval=3201397653 TSecr=3201397653 SLE=5147241 SRE=5278207
339 40	.8	127	127	TCP	4460	58890 → 5080 [I	PSH,	ACK] Seq=5278207 Ack=25 Win=65536 Len=4394 TSval=3201397653 TSecr=3201397653
340 40	.8	127	127	TCP	78	[TCP Dup ACK 3:	34#3	] 5080 → 58890 [ACK] Seq=25 Ack=5081758 Win=2324480 Len=0 TSval=3201397653 TSecr=3201397653 SLE=5147241 SRE=5282601
341 40	.8				65549		ansm	ission] 58890 → 5080 [ACK] Seq=5081758 Ack=25 Win=65536 Len=65483 TSval=3201397653 TSecr=3201397653
342 43	3 . 2	127	127	TCP	70	58890 + 5080 [I	FIN,	PSH, ACK] Seq=5282601 Ack=25 Win=65536 Len=4 TSval=3201400065 TSecr=3201397653
343 43	3.2	127	127	TCP	66	5080 + 58890 [1	FIN,	ACK] Seq=25 Ack=5282606 Win=2489472 Len=0 TSval=3201400065 TSecr=3201400065
344 43	3.2	127	127	TCP	66	58890 + 5080 [A	ACK]	Seq=5282606 Ack=26 Win=65536 Len=0 TSval=3201400065 TSecr=3201400065
						-	-	

## 2.2 Average sending times comparisons

#### 2.2.1 0% lost

```
Run time of part A, number 1: (0 second,382514 microseconed)
Run time of part B, number 1: (0 second,364848 microseconed)
Run time of part A, number 2: (0 second,397440 microseconed)
Run time of part B, number 2: (0 second,353881 microseconed)
Run time of part A, number 3: (0 second,449981 microseconed)
Run time of part B, number 3: (0 second,404768 microseconed)
Run time of part A, number 4: (0 second,412190 microseconed)
Run time of part B, number 4: (0 second,432812 microseconed)
Run time of part A, number 5: (0 second,385328 microseconed)
Run time of part B, number 5: (0 second,396392 microseconed)
The average time of part B is: (0 second,390540 microsecond)
The average time of part B is: (0 second,390540 microsecond)
```

we can see in this picture that the average time of sending part A according to CUBIC algorithm and the average time of sending part B according to RENO algorithm is very tight because we have 0% of packets, so the difference is minor.

#### 2.2.2 10% lost

```
Run time of part A, number 1: (0 second,348695 microseconed)
Run time of part B, number 1: (1 second,191670 microseconed)
Run time of part A, number 2: (0 second,364939 microseconed)
Run time of part B, number 2: (0 second,370341 microseconed)
Run time of part A, number 3: (0 second,368599 microseconed)
Run time of part B, number 3: (0 second,350846 microseconed)
Run time of part A, number 4: (0 second,383747 microseconed)
Run time of part B, number 4: (0 second,370831 microseconed)
Run time of part A, number 5: (0 second,366258 microseconed)
Run time of part B, number 5: (0 second,366258 microseconed)
The average time of part A is: (0 second,366447 microsecond)
The average time of part B is: (0 second,526675 microsecond)
```

we can see in this picture that the average time of sending part A according to CUBIC algorithm is smaller than average time of sending part B according to RENO algorithm. Now we have 10% packets lost

therefore the gap is bigger than in 0% packets lost.

#### 2.2.3 15% lost

```
Run time of part A, number 1: (0 second,655956 microseconed)
Run time of part B, number 1: (1 second,105410 microseconed)
Run time of part A, number 2: (0 second,396812 microseconed)
Run time of part B, number 2: (0 second,387765 microseconed)
Run time of part A, number 3: (0 second,408344 microseconed)
Run time of part B, number 3: (0 second,382666 microseconed)
Run time of part A, number 4: (0 second,384138 microseconed)
Run time of part B, number 4: (0 second,388138 microseconed)
Run time of part A, number 5: (0 second,408206 microseconed)
Run time of part B, number 5: (0 second,408206 microseconed)
The average time of part A is: (0 second,453159 microsecond)
The average time of part B is: (0 second,529187 microsecond)
```

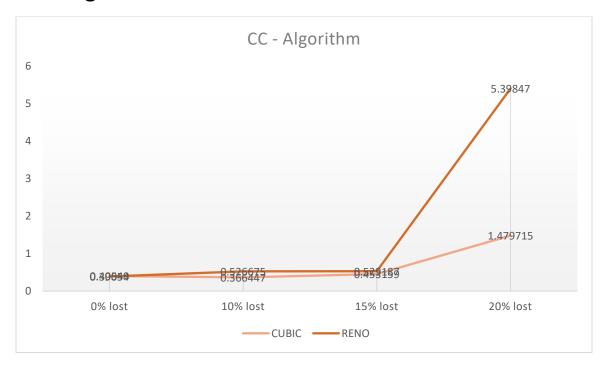
We can see the difference of the average time

#### 2.2.4 20% lost

```
Run time of part A, number 1 : (0 second,986824 microseconed)
Run time of part B, number 1 : (3 second,671700 microseconed)
Run time of part A, number 2 : (1 second,751704 microseconed)
Run time of part B, number 2 : (3 second,86643 microseconed)
Run time of part A, number 3 : (0 second,492068 microseconed)
Run time of part B, number 3 : (15 second,507689 microseconed)
Run time of part A, number 4 : (0 second,389429 microseconed)
Run time of part B, number 4 : (0 second,364943 microseconed)
Run time of part A, number 5 : (3 second,778553 microseconed)
Run time of part B, number 5 : (2 second,568264 microseconed)
The average time of part A is: (1 second,479715 microsecond)
The average time of part B is: (5 second,39847 microsecond)
```

We can see the difference of the average time

# 2.3 Diagram



### 2.4 Conclusions

We can understand from the previous pages that sending the first half of the file according to CUBIC CC – Algorithm is faster than sending the second half of the file according to RENO CC – Algorithm.

This can be seen in all five sending of the file, and this is the reason we send five times -> to be assured that our results are reliable.

According to the diagram: the more packets we have that are lost, then the gap between the times of sending first half to sending the second half increases. Also, we can see that the more packets we have that are lost, then the time to send the file is getting longer.

In Wireshark's recording we can see the difference between the 0% lost to 10% lost to 15% lost and to 20% lost. The more losses we have the more 'black packets' appear in Wireshark.

In addition, it is possible to see in Wireshark's recording the principles that we learned in class about the TCP algorithm actualize, such as:

Increasing the receiver's window when it is full and decreasing the window when it reaches the thresholdy

And we can see in the receiver's ACK messages, the principle of Cumulativeness, which means that the receiver sends the last ACK that he received, which contains all the ACK before it.

## 2.5 Bibliography

### <u>Cubic and Reno CC – Algorithm</u>

https://squidarth.com/rc/programming/networking/2018/08/01/congestion-cubic.html

#### How to calculate time

https://www.youtube.com/watch?v=cunJcNgtxMk&feature=youtu.be

#### About the functions

'man' command on vs terminal

### For many things

ChatGPT: Optimizing Language Models for Dialogue (openai.com)

https://www.google.com/search?gs\_ssp=eJzj4tTP1TcwMU02T1JgNGB0YPBiS8\_PT 89JBQBASQXT&q=google&oq=googlr&aqs=chrome.1.69i57j46i10i131i199i433i46 5i512j0i10i131i433i512l4j69i60j69i65.3825j0j4&sourceid=chrome&ie=UTF-8