Universidad del Valle de Guatemala **30/07/2024**

Networks

Section ## 20

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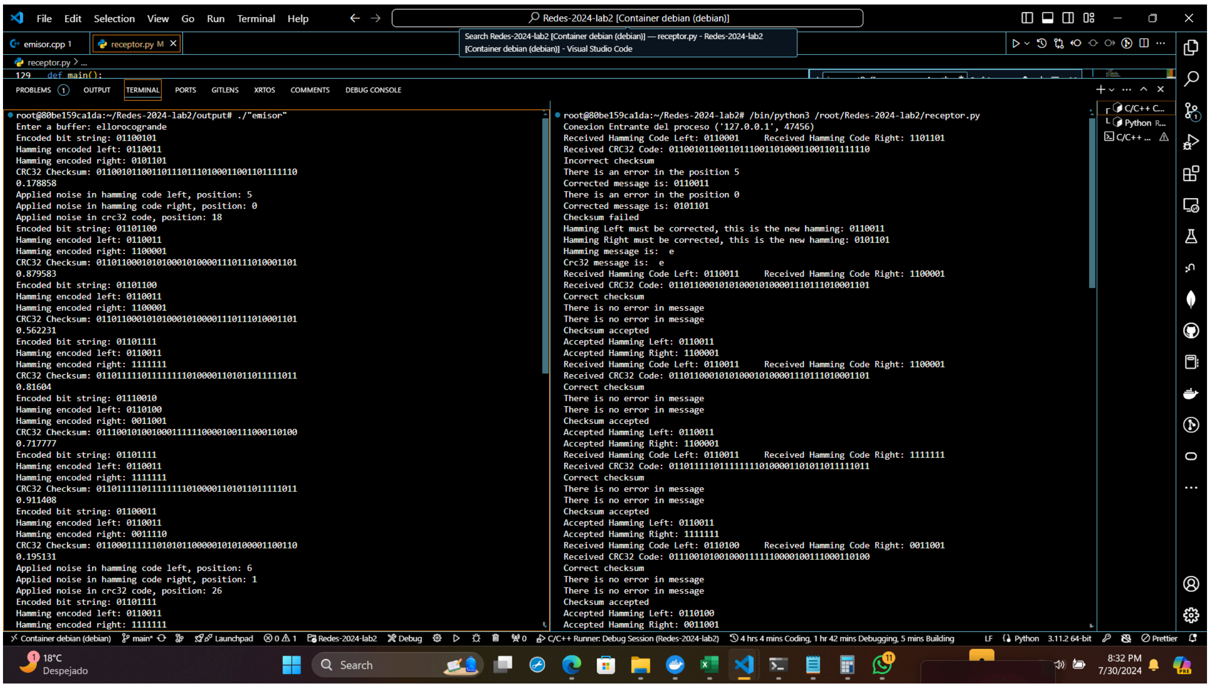
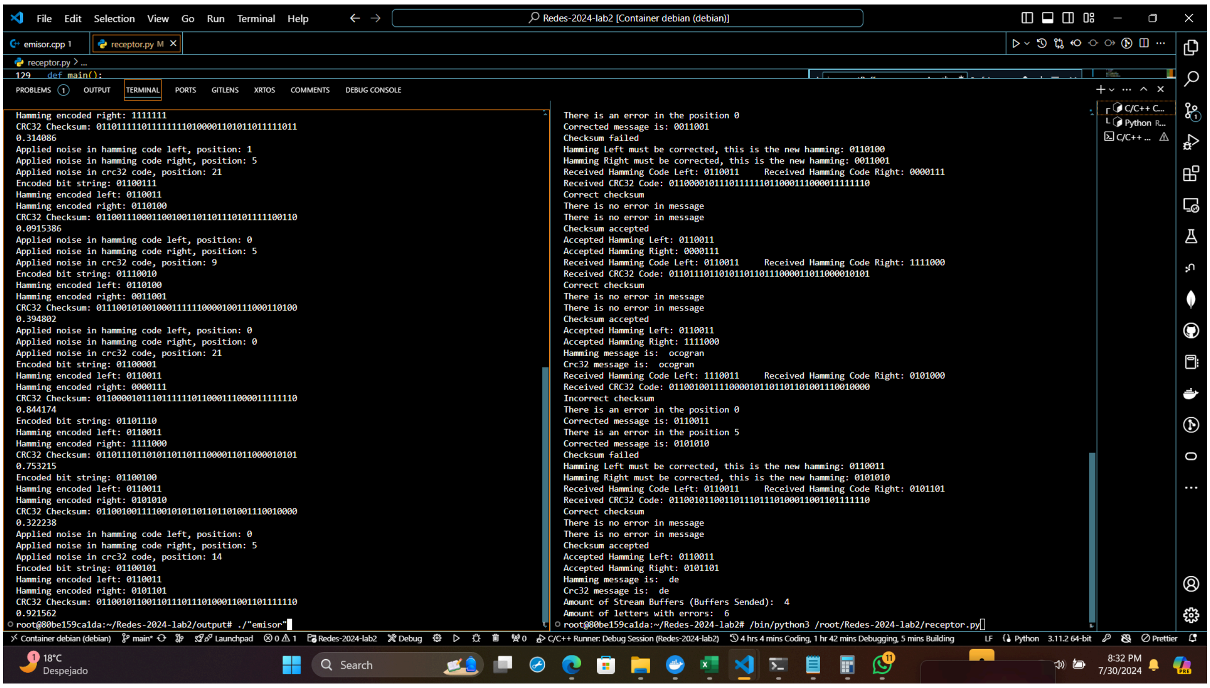
Detection and Correction Schemes. Pt2

Lab # 2
Networks# 20

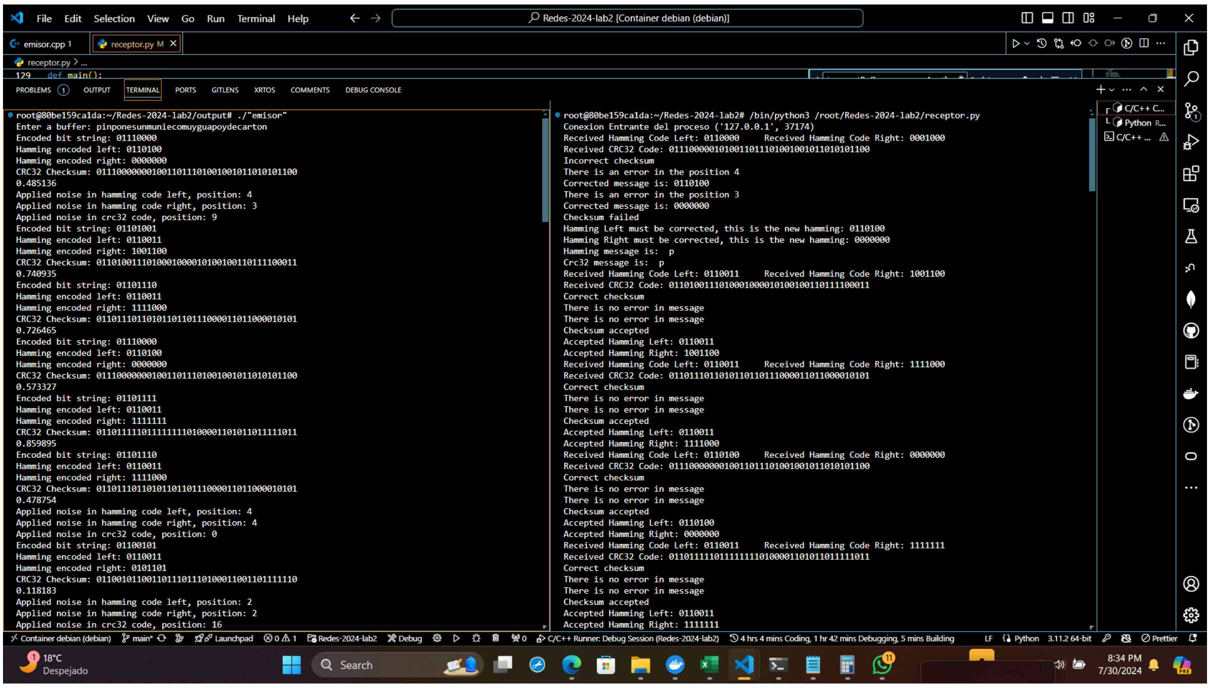
Tests

Test 1

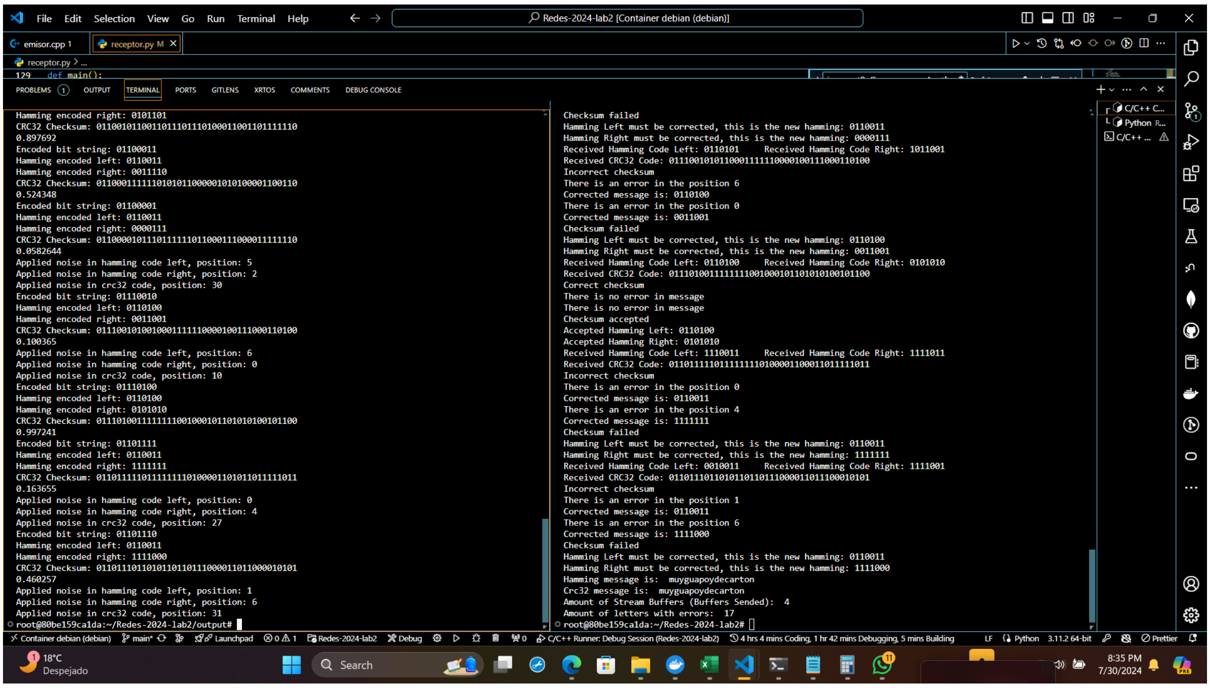




Test 2

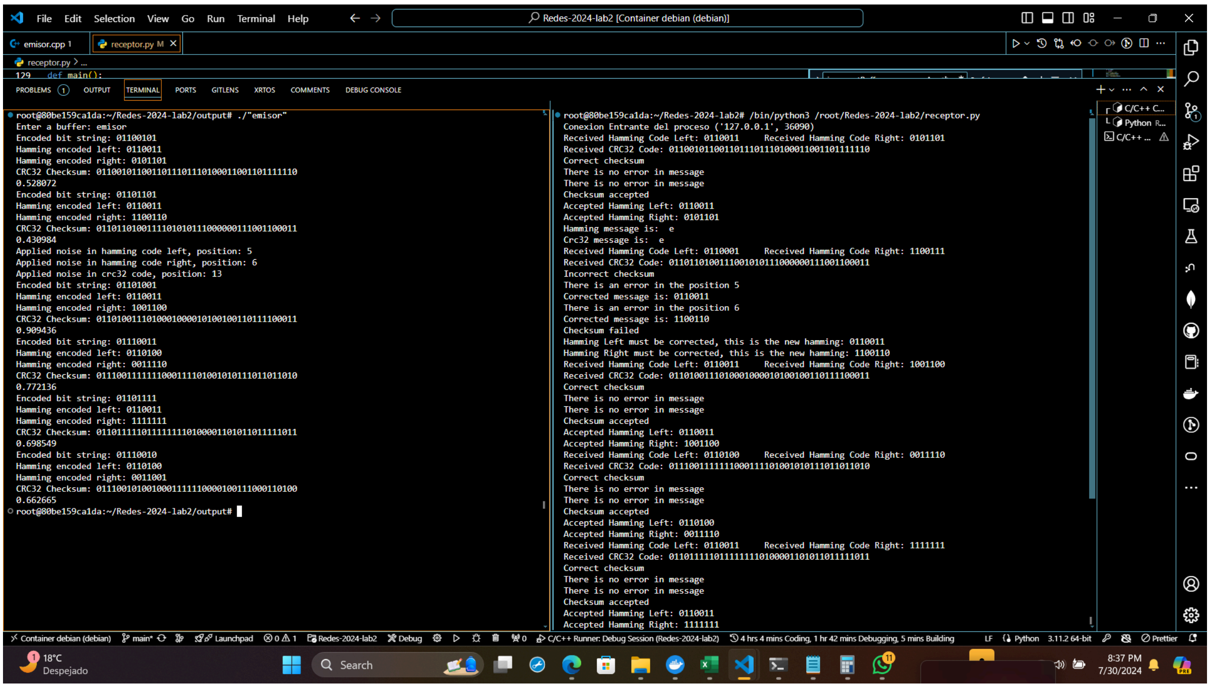


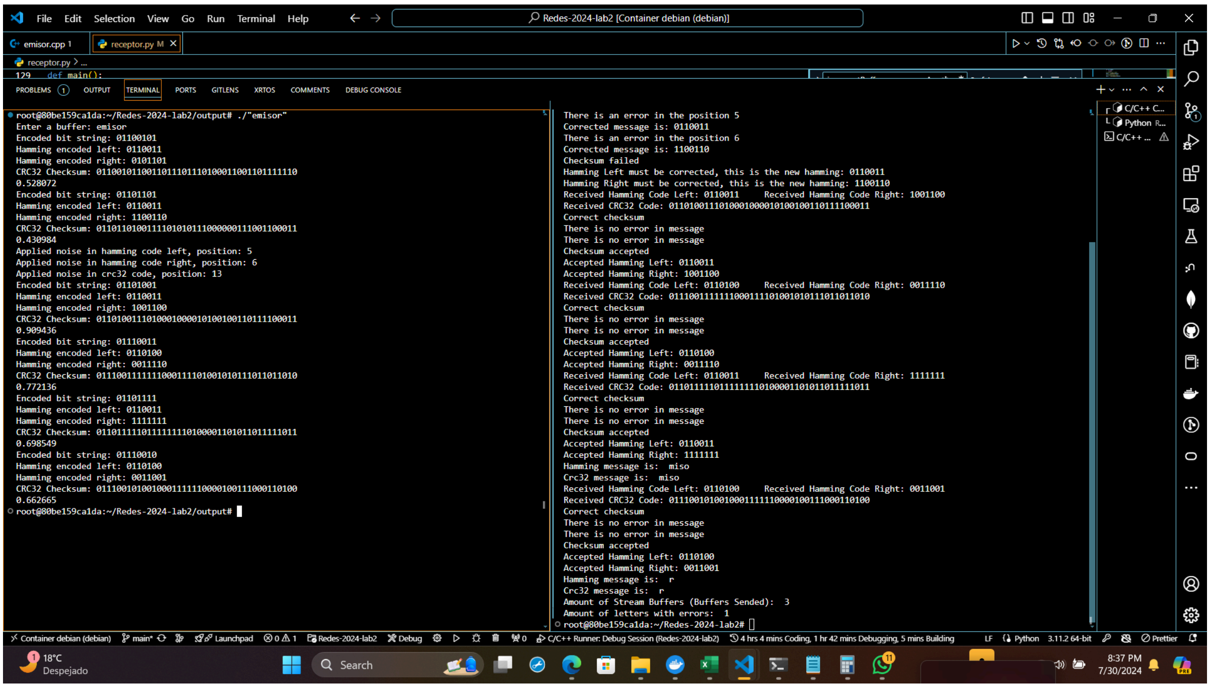
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 [Container debian (debian)]
emisor.cpp 1
receptor.py M
PROBLEMS OUTPUT TERMINAL PORTS GITLENS XRTOS COMMENTS DEBUG CONSOLE
Enter a buffer: pinponesunmuniecomuyguapoydecarton
Conexion Entrante del proceso ('127.0.0.1', 37174)
18°C
Despejado
Search
8:34 PM
7/30/2024



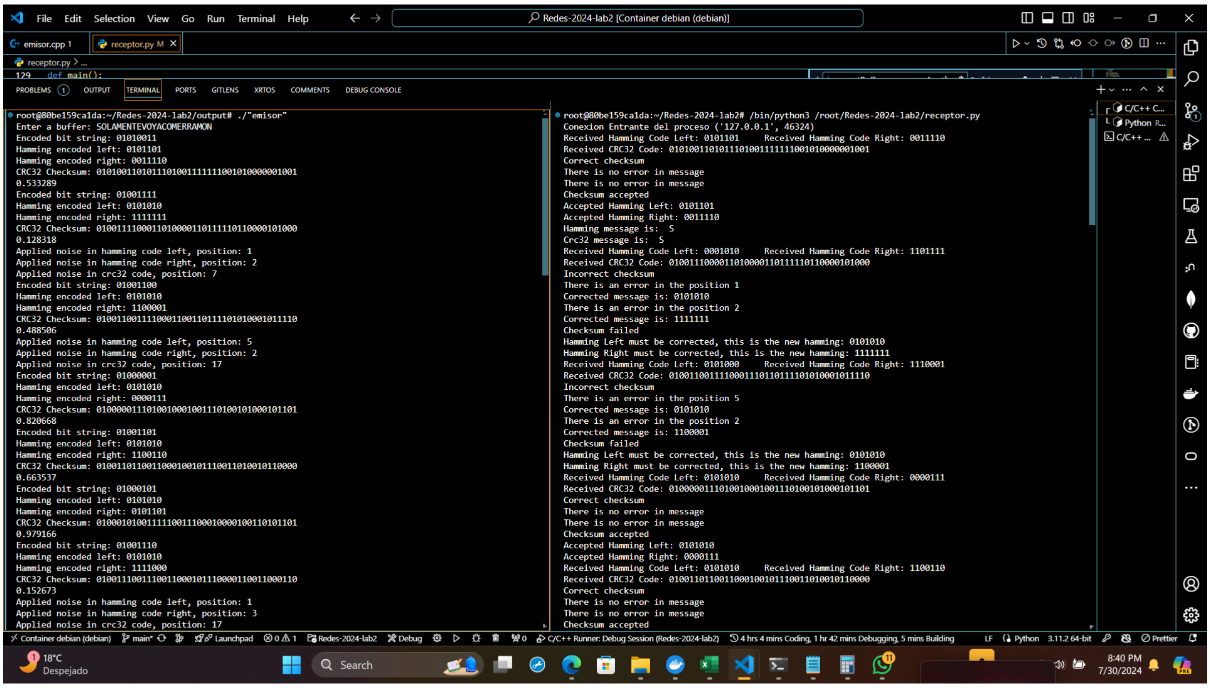
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 [Container debian (debian)]
emisor.cpp 1
receptor.py M
PROBLEMS OUTPUT TERMINAL PORTS GITLENS XRTOS COMMENTS DEBUG CONSOLE
Hamming message is: muyguapoydecarton
Crc32 message is: muyguapoydecarton
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 17
18°C
Despejado
Search
8:35 PM
7/30/2024

Test 3

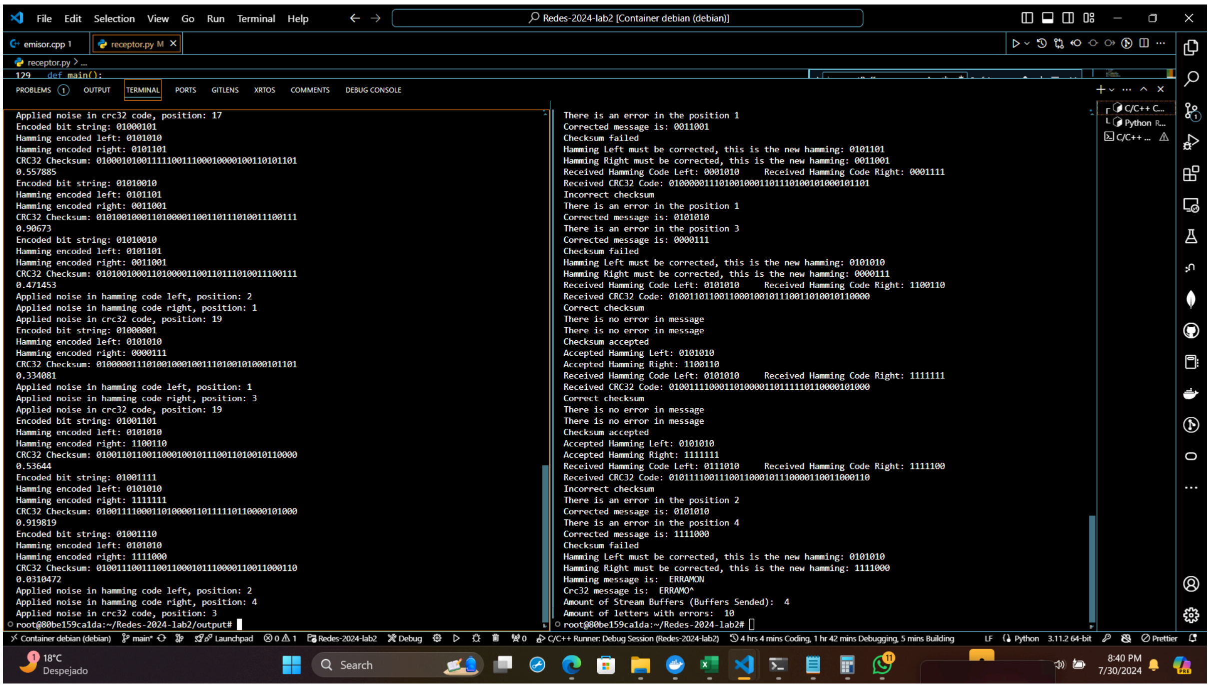




Test 4

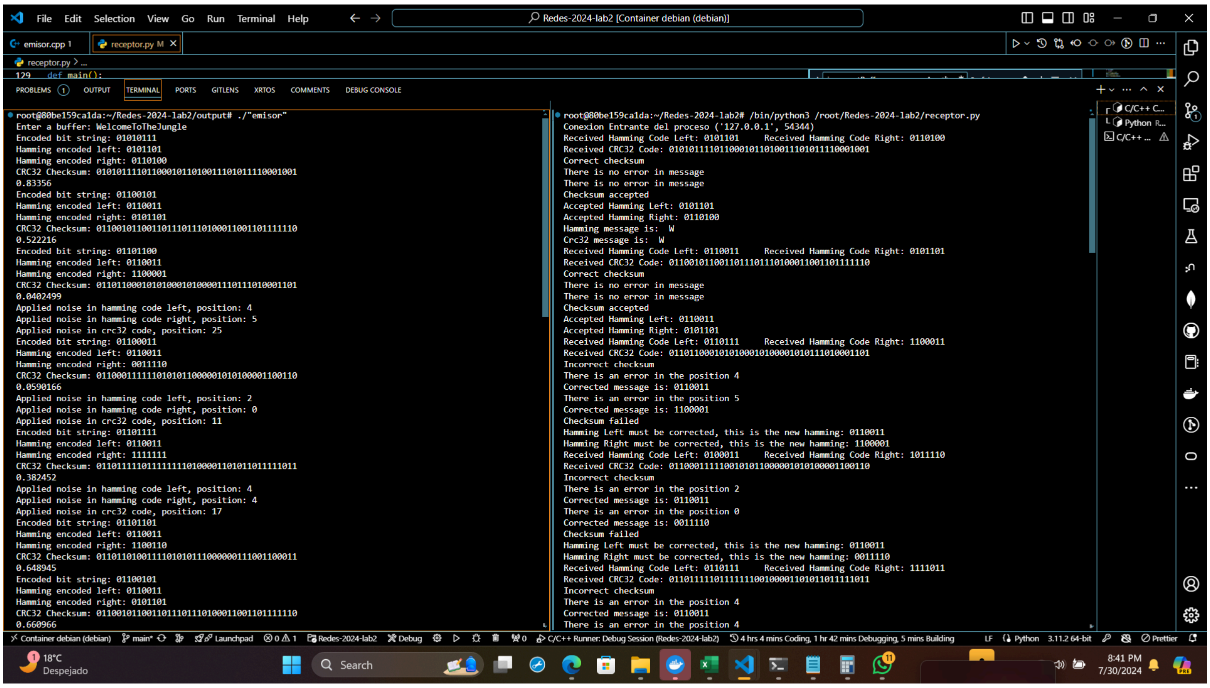


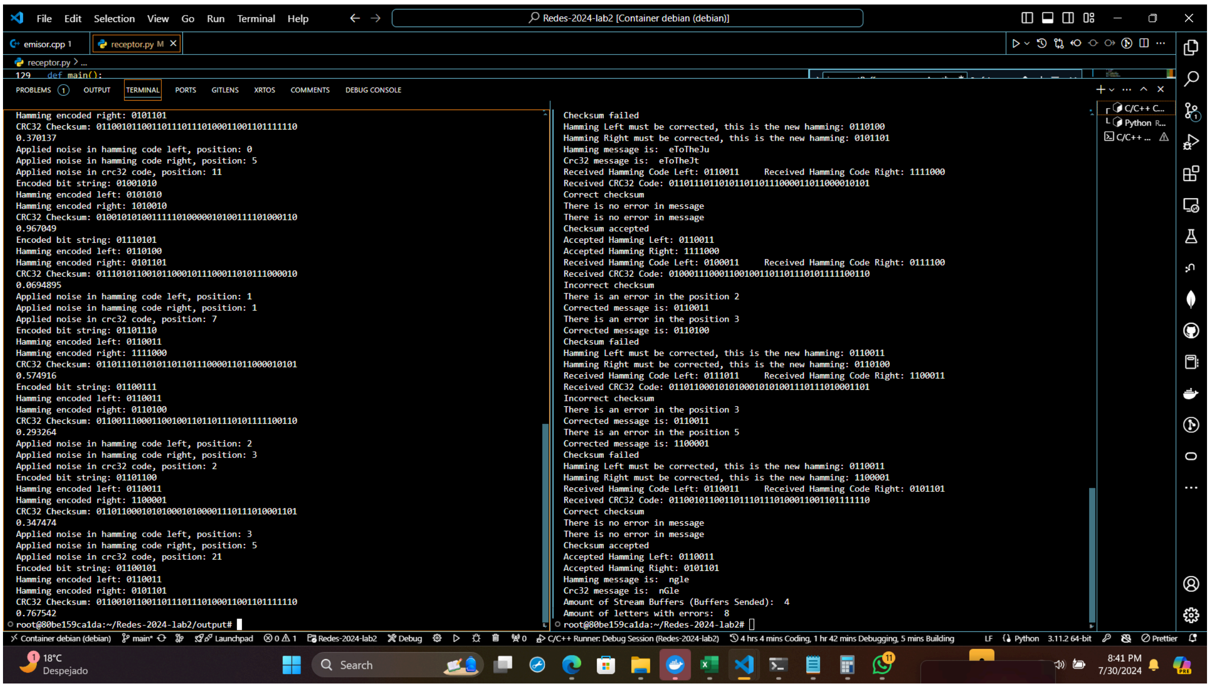
root@80be159ca1da:~/Redes-2024-lab2/output# ./"emisor"
Enter a buffer: SOLAMENTEVOYACOMERRAMON
Encoded bit string: 01010011
Hamming encoded left: 0101101
Hamming encoded right: 0011110
CRC32 Checksum: 01010011010111010011111110010100000001001
0.533289
Encoded bit string: 01001111
Hamming encoded left: 0101010
Hamming encoded right: 1111111
CRC32 Checksum: 01001111000110100001101111101100001010000
0.128318
Applied noise in hamming code left, position: 1
Applied noise in hamming code right, position: 2
Applied noise in crc32 code, position: 7
Encoded bit string: 01001100
Hamming encoded left: 0101010
Hamming encoded right: 1100001
CRC32 Checksum: 01001100111100011001101111010100010111110
0.488506
Applied noise in hamming code left, position: 5
Applied noise in hamming code right, position: 2
Applied noise in crc32 code, position: 17
Encoded bit string: 01000001
Hamming encoded left: 0101010
Hamming encoded right: 0000111
CRC32 Checksum: 01000001110100100010011101001010001011010
0.820668
Encoded bit string: 01001101
Hamming encoded left: 0101010
Hamming encoded right: 1100110
CRC32 Checksum: 01001101100110001001011100110100101100000
0.663537
Encoded bit string: 01000101
Hamming encoded left: 0101010
Hamming encoded right: 0101101
CRC32 Checksum: 01000101001111100111000100001001101011010
0.979166
Encoded bit string: 01001110
Hamming encoded left: 0101010
Hamming encoded right: 1111000
CRC32 Checksum: 01001110011100110001011100001100110001100
0.152673
Applied noise in hamming code left, position: 1
Applied noise in hamming code right, position: 3
Applied noise in crc32 code, position: 17
root@80be159ca1da:~/Redes-2024-lab2# /bin/python3 /root/Redes-2024-lab2/receptor.py
Conexion Entrante del proceso ('127.0.0.1', 46324)
Received Hamming Code Left: 0101101 Received Hamming Code Right: 0011110
Received CRC32 Code: 01010011010111010011111110010100000001001
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0101101
Accepted Hamming Right: 0011110
Hamming message is: S
Crc32 message is: S
Received Hamming Code Left: 0001010 Received Hamming Code Right: 1101111
Received CRC32 Code: 01001110000110100001101111101100001010000
Incorrect checksum
There is an error in the position 1
Corrected message is: 0101010
There is an error in the position 2
Corrected message is: 1111111
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0101010
Hamming Right must be corrected, this is the new hamming: 1111111
Received Hamming Code Left: 0101000 Received Hamming Code Right: 1110001
Received CRC32 Code: 01001100111100011101101111010100010111110
Incorrect checksum
There is an error in the position 5
Corrected message is: 0101010
There is an error in the position 2
Corrected message is: 1100001
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0101010
Hamming Right must be corrected, this is the new hamming: 1100001
Received Hamming Code Left: 0101010 Received Hamming Code Right: 0000111
Received CRC32 Code: 01000001110100100010011101001010001011010
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0101010
Accepted Hamming Right: 0000111
Received Hamming Code Left: 0101010 Received Hamming Code Right: 1100110
Received CRC32 Code: 01001101100110001001011100110100101100000
Correct checksum
There is no error in message
There is no error in message
Checksum accepted



Applied noise in crc32 code, position: 17
Encoded bit string: 01000101
Hamming encoded left: 0101010
Hamming encoded right: 0101101
CRC32 Checksum: 01000101001111100111000100001001101011010
0.557885
Encoded bit string: 01010010
Hamming encoded left: 0101101
Hamming encoded right: 0011001
CRC32 Checksum: 01010010001101000011001101110100111001111
0.90673
Encoded bit string: 01010010
Hamming encoded left: 0101101
Hamming encoded right: 0011001
CRC32 Checksum: 01010010001101000011001101110100111001111
0.471453
Applied noise in hamming code left, position: 2
Applied noise in hamming code right, position: 1
Applied noise in crc32 code, position: 19
Encoded bit string: 01000001
Hamming encoded left: 0101010
Hamming encoded right: 0000111
CRC32 Checksum: 01000001110100100010011101001010001011010
0.334081
Applied noise in hamming code left, position: 1
Applied noise in hamming code right, position: 3
Applied noise in crc32 code, position: 19
Encoded bit string: 01001101
Hamming encoded left: 0101010
Hamming encoded right: 1100110
CRC32 Checksum: 01001101100110001001011100110100101100000
0.53644
Encoded bit string: 01001111
Hamming encoded left: 0101010
Hamming encoded right: 1111111
CRC32 Checksum: 01001111000110100001101111101100001010000
0.919819
Encoded bit string: 01001110
Hamming encoded left: 0101010
Hamming encoded right: 1111000
CRC32 Checksum: 01001110011100110001011100001100110001100
0.0310472
Applied noise in hamming code left, position: 2
Applied noise in hamming code right, position: 4
Applied noise in crc32 code, position: 3
root@80be159ca1da:~/Redes-2024-lab2/output#
There is an error in the position 1
Corrected message is: 0011001
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0101101
Hamming Right must be corrected, this is the new hamming: 0011001
Received Hamming Code Left: 0001010 Received Hamming Code Right: 0001111
Received CRC32 Code: 01000001110100100011011101001010001011010
Incorrect checksum
There is an error in the position 1
Corrected message is: 0101010
There is an error in the position 3
Corrected message is: 0000111
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0101010
Hamming Right must be corrected, this is the new hamming: 0000111
Received Hamming Code Left: 0101010 Received Hamming Code Right: 1100110
Received CRC32 Code: 01001101100110001001011100110100101100000
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0101010
Accepted Hamming Right: 1100110
Received Hamming Code Left: 0101010 Received Hamming Code Right: 1111111
Received CRC32 Code: 01001111000110100001101111101100001010000
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0101010
Accepted Hamming Right: 1111111
Received Hamming Code Left: 0111010 Received Hamming Code Right: 1111100
Received CRC32 Code: 01011110011100110001011100001100110001100
Incorrect checksum
There is an error in the position 2
Corrected message is: 0101010
There is an error in the position 4
Corrected message is: 1111000
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0101010
Hamming Right must be corrected, this is the new hamming: 1111000
Hamming message is: ERRAMON
Crc32 message is: ERRAMO^
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 10
root@80be159ca1da:~/Redes-2024-lab2#

Test 5


Redes-2024-lab2 [Container debian (debian)]


Redes-2024-lab2 [Container debian (debian)]

Test 6

```
root@80be159ca1da:~/Redes-2024-lab2/output# ./"emisor"
Enter a buffer: 1234567890
Encoded bit string: 00110001
Hamming encoded left: 0011110
Hamming encoded right: 0000111
CRC32 Checksum: 00110001010101111010100010011000000100111
0.386209
Applied noise in hamming code left, position: 3
Applied noise in hamming code right, position: 3
Applied noise in crc32 code, position: 29
Encoded bit string: 00110010
Hamming encoded left: 0011110
Hamming encoded right: 0011001
CRC32 Checksum: 00110010101111000010100010100000001010001
0.566007
Encoded bit string: 00110011
Hamming encoded left: 0011110
Hamming encoded right: 0011110
CRC32 Checksum: 00110011110101010010010001000000010111111
0.58875
Encoded bit string: 00110100
Hamming encoded left: 0011110
Hamming encoded right: 0101010
CRC32 Checksum: 00110100110100101111001000111011010010001
0.970978
Encoded bit string: 00110101
Hamming encoded left: 0011110
Hamming encoded right: 0101101
CRC32 Checksum: 00110101101110111111111101101101110100111
0.902416
Encoded bit string: 00110110
Hamming encoded left: 0011110
Hamming encoded right: 0110011
CRC32 Checksum: 00110110010100000111111011100011110100001
0.107703
Applied noise in hamming code left, position: 6
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 26
Encoded bit string: 00110111
Hamming encoded left: 0011110
Hamming encoded right: 0110100
CRC32 Checksum: 00110111001110010111001000000001100111111
0.607744
Encoded bit string: 00111000
Hamming encoded left: 0011110
Hamming encoded right: 1001011
```

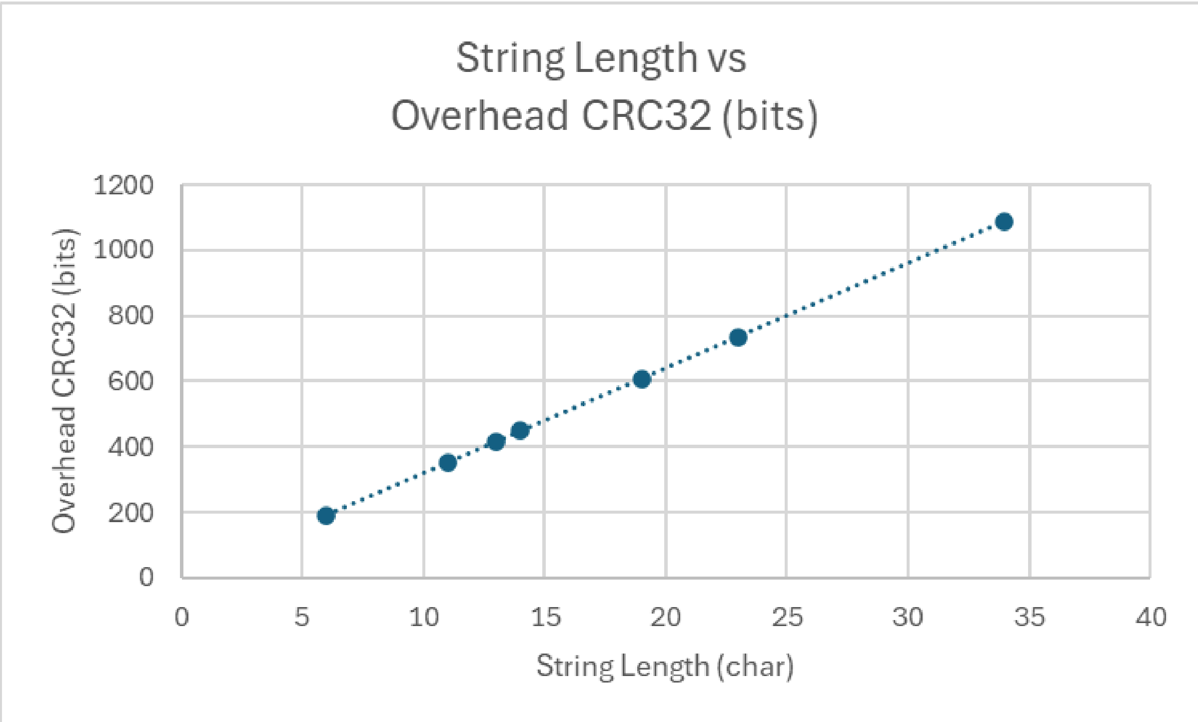
```
root@80be159ca1da:~/Redes-2024-lab2# /bin/python3 /root/Redes-2024-lab2/receptor.py
Conexion Entrante del proceso ('127.0.0.1', 60160)
Received Hamming Code Left: 0010110     Received Hamming Code Right: 0001111
Received CRC32 Code: 00110001010101111010100010011100000100111
Incorrect checksum
There is an error in the position 3
Corrected message is: 0011110
There is an error in the position 3
Corrected message is: 0000111
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0011110
Hamming Right must be corrected, this is the new hamming: 0000111
Hamming message is:  1
Crc32 message is:  1
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0011001
Received CRC32 Code: 00110010101111000010100010100000001010001
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0011110
Accepted Hamming Right: 0011001
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0011110
Received CRC32 Code: 00110011110101010010010001000000010111111
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0011110
Accepted Hamming Right: 0011110
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0101010
Received CRC32 Code: 00110100110100101111001000111011010010001
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0011110
Accepted Hamming Right: 0101010
Hamming message is:  234
Crc32 message is:  234
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0101101
Received CRC32 Code: 00110101101110111111111101101101110100111
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
```

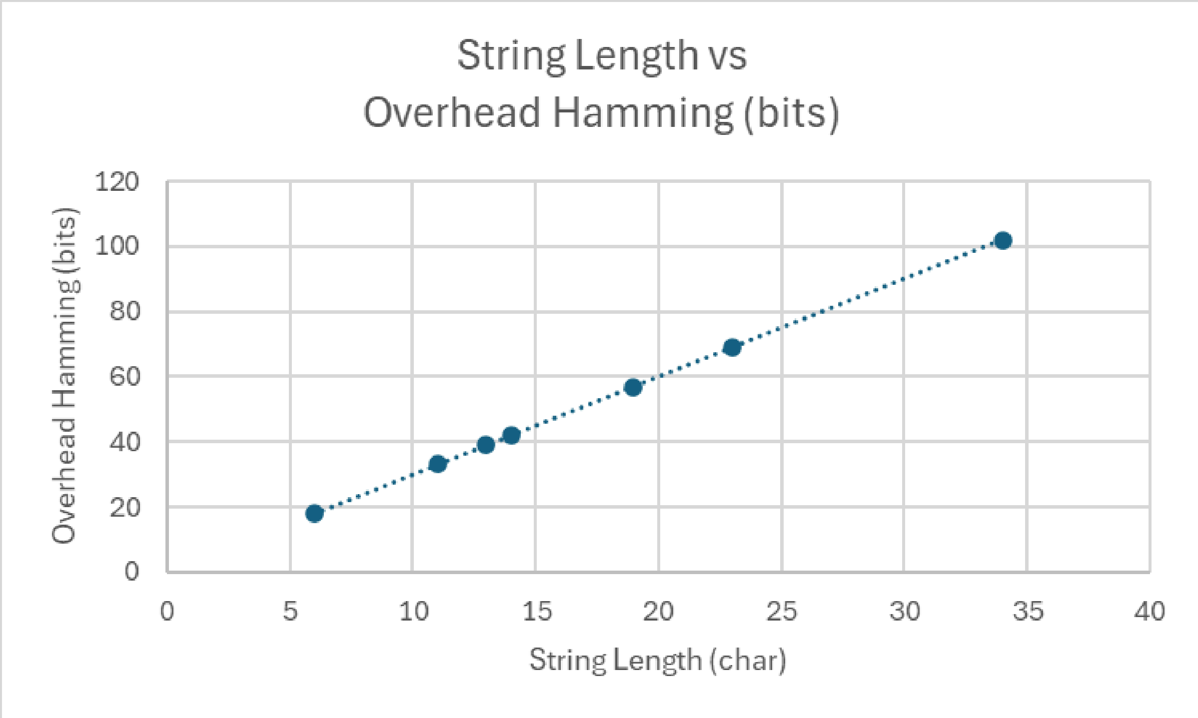
```
0.58875
Encoded bit string: 00110100
Hamming encoded left: 0011110
Hamming encoded right: 0101010
CRC32 Checksum: 00110100110100101111001000111011010010001
0.970978
Encoded bit string: 00110101
Hamming encoded left: 0011110
Hamming encoded right: 0101101
CRC32 Checksum: 00110101101110111111111101101101110100111
0.902416
Encoded bit string: 00110110
Hamming encoded left: 0011110
Hamming encoded right: 0110011
CRC32 Checksum: 00110110010100000111111011100011110100001
0.107703
Applied noise in hamming code left, position: 6
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 26
Encoded bit string: 00110111
Hamming encoded left: 0011110
Hamming encoded right: 0110100
CRC32 Checksum: 00110111001110010111001000000001100111111
0.607744
Encoded bit string: 00111000
Hamming encoded left: 0011110
Hamming encoded right: 1001011
CRC32 Checksum: 00111000100110000100001001000101110101100
0.120481
Applied noise in hamming code left, position: 3
Applied noise in hamming code right, position: 3
Applied noise in crc32 code, position: 20
Encoded bit string: 00111001
Hamming encoded left: 0011110
Hamming encoded right: 1001100
CRC32 Checksum: 00111001111110001010011101010010100111010
0.220043
Applied noise in hamming code left, position: 5
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 31
Encoded bit string: 00110000
Hamming encoded left: 0011110
Hamming encoded right: 0000000
CRC32 Checksum: 00110000000111110101001000111100011001001
0.96031
root@80be159ca1da:~/Redes-2024-lab2/output#
```

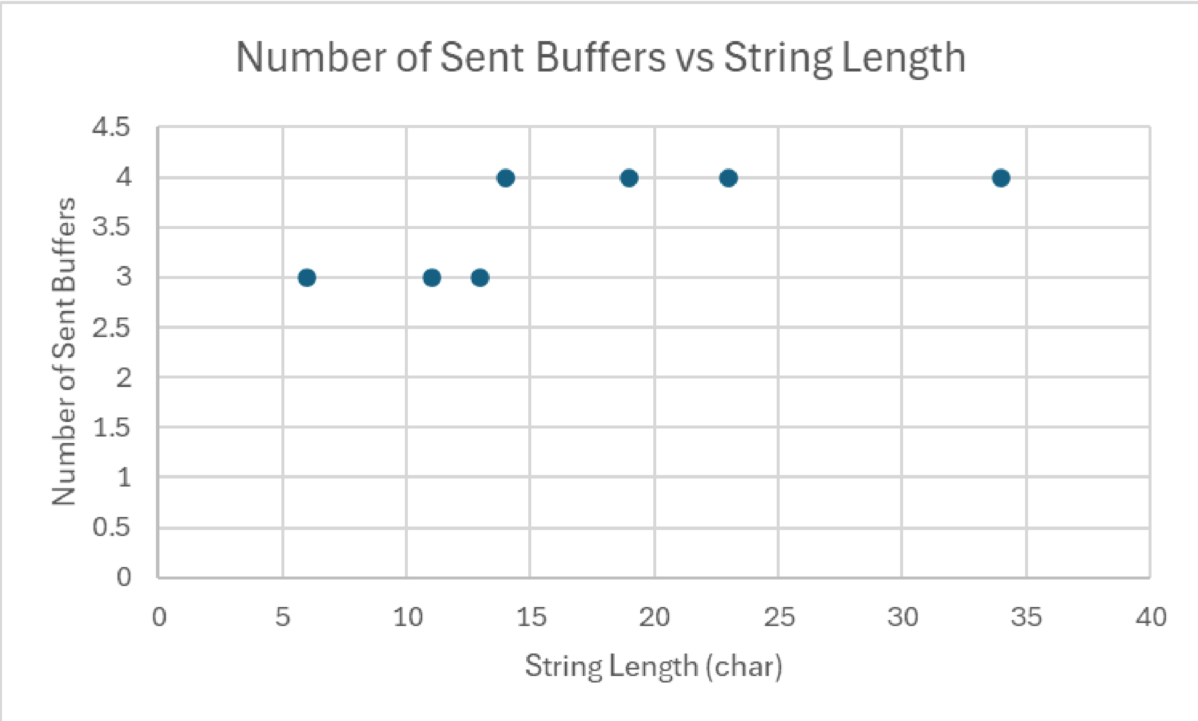
```
There is an error in the position 0
Corrected message is: 0110011
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0011110
Hamming Right must be corrected, this is the new hamming: 0110011
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0110100
Received CRC32 Code: 00110111001110010111001000000001100111111
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0011110
Accepted Hamming Right: 0110100
Received Hamming Code Left: 0010110     Received Hamming Code Right: 1000011
Received CRC32 Code: 00111000100110000100101001000101110101100
Incorrect checksum
There is an error in the position 3
Corrected message is: 0011110
There is an error in the position 3
Corrected message is: 1001011
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0011110
Hamming Right must be corrected, this is the new hamming: 1001011
Received Hamming Code Left: 0011100     Received Hamming Code Right: 0001100
Received CRC32 Code: 00111001111110001010011101010010000111010
Incorrect checksum
There is an error in the position 5
Corrected message is: 0011110
There is an error in the position 0
Corrected message is: 1001100
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0011110
Hamming Right must be corrected, this is the new hamming: 1001100
Received Hamming Code Left: 0011110     Received Hamming Code Right: 0000000
Received CRC32 Code: 00110000000111110101001000111100011001001
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0011110
Accepted Hamming Right: 0000000
Hamming message is:  567890
Crc32 message is:  567890
Amount of Stream Buffers (Buffers Sended):  3
Amount of letters with errors:  4
root@80be159ca1da:~/Redes-2024-lab2#
```

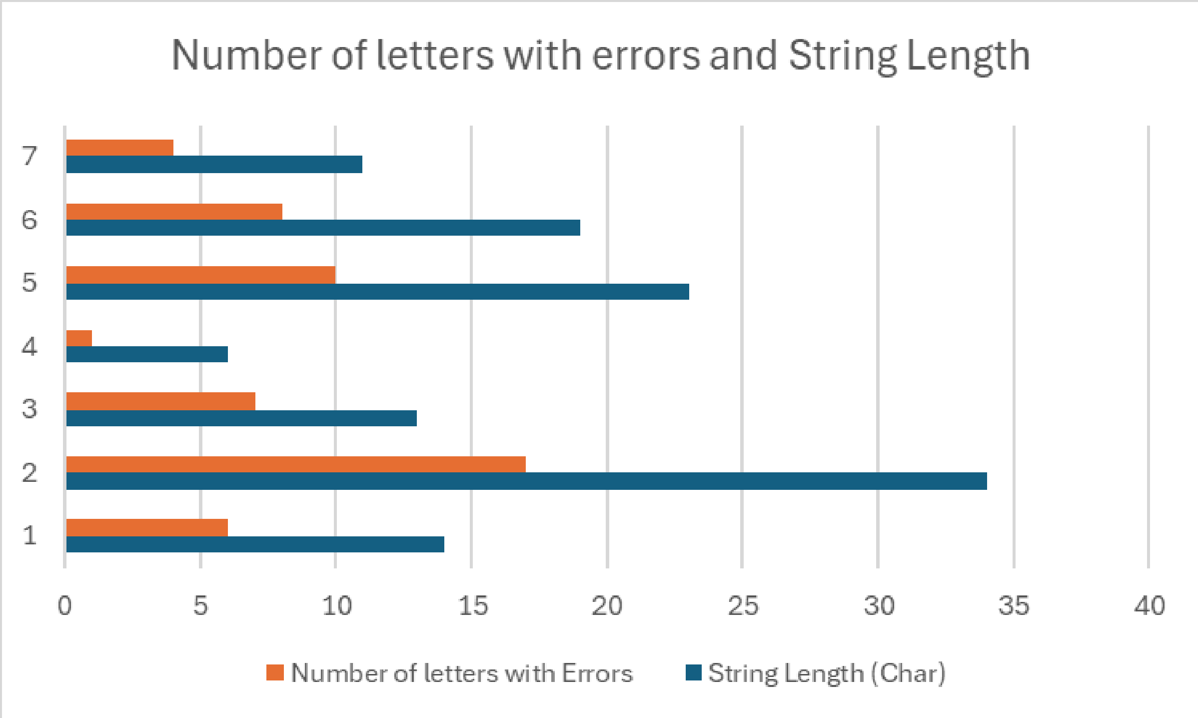
Results

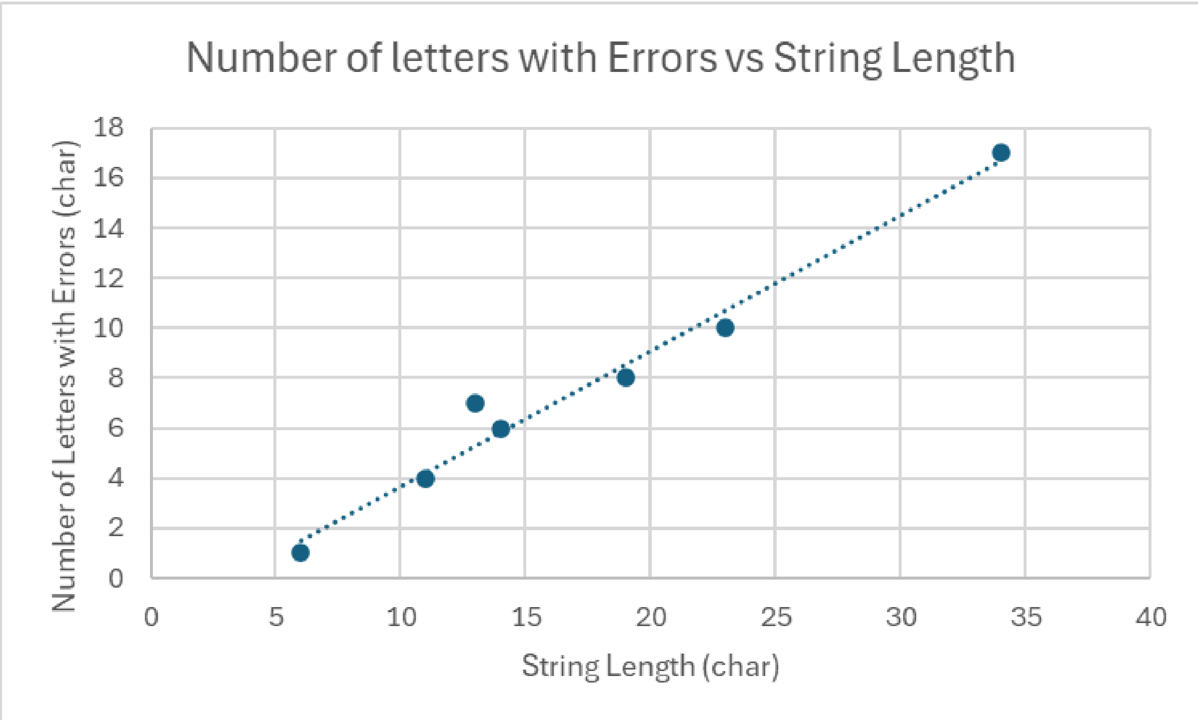
Chain	String Length (Char)	# of Sent Buffers	Overhead Hamming (bits)	Overhead CRC32 (bits)	Number of letters with Errors	Percent Error
ellorocogrande	14	4	42	448	6	42.86%
pinponesunmunieco muyguapoydecarton	34	4	102	1088	17	50.00%
RaulSeleccion	13	3	39	416	7	53.85%
emisor	6	3	18	192	1	16.67%
SOLAMENTEVOYA COMERRAMON	23	4	69	736	10	43.48%
WelcomeToTheJung le	19	4	57	608	8	42.11%
1234567890	11	3	33	352	4	36.36%




String Length vs
Overhead Hamming (bits)
Overhead Hamming (bits)
0
20
40
60
80
100
120
0
5
10
15
20
25
30
35
40
String Length (char)


Number of Sent Buffers vs String Length
Number of Sent Buffers
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
5
10
15
20
25
30
35
40
String Length (char)





Discussion

Based on the 6 tests we did we saw that the algorithm with the best performance was Hamming because it was capable of correcting the messages. Also, as you can see the amount of Overhead used by Hamming represents 10 times less than the CRC32, as we see it is more efficient and is capable of correcting the messages. Also, we can see that in most cases there are errors so it's really recommended an algorithm capable of correcting the mistakes. In this particular case we couldn't see the best use case for mistakes detection algorithms because it was a case that needed a lot of mistake correction, probably the best use case is a context where it needs to ensure the best data possible. So we can conclude that it will depend on the use case needed for the best algorithms.