

Networks

Section ## 20

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Detection and Correction Schemes. Pt2

**Lab # 2
Networks# 20**

Tests

Test 1

```
129 def main():
    root@80be159ca1da:~/Redes-2024-lab2/output# ./emisor
Enter a buffers: 01100001
Encoded bit string: 01100101
Hamming encoded left: 0110011
Hamming encoded right: 0101101
CRC32 Checksum: 011001010010111011010001100110111110
0.178858
Applied noise in hamming code left, position: 5
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 18
Encoded bit string: 01101100
Hamming encoded left: 0110011
Hamming encoded right: 1100001
CRC32 Checksum: 0110100010101000101000011101101000101
0.879583
Encoded bit string: 01101100
Hamming encoded left: 0110011
Hamming encoded right: 1100001
CRC32 Checksum: 0110100010101000101000011101101000101
0.562231
Encoded bit string: 01101111
Hamming encoded left: 0110011
Hamming encoded right: 1111111
CRC32 Checksum: 01101110011111110100001010101111011
0.81604
Encoded bit string: 0110010
Hamming encoded left: 0110100
Hamming encoded right: 001001
CRC32 Checksum: 0111001010100001111000010011000110100
0.717777
Encoded bit string: 01101111
Hamming encoded left: 0110011
Hamming encoded right: 1111111
CRC32 Checksum: 01101110111111110100001010101111011
0.911408
Encoded bit string: 01100011
Hamming encoded left: 0110011
Hamming encoded right: 001110
CRC32 Checksum: 0110001111101010100000101010000100110
0.195131
Applied noise in hamming code left, position: 6
Applied noise in hamming code right, position: 1
Applied noise in crc32 code, position: 26
Encoded bit string: 01101111
Hamming encoded left: 0110011
Hamming encoded right: 1111111
CRC32 Checksum: 01101110111111110100001010101111011
0.31406
Applied noise in hamming code left, position: 1
Applied noise in hamming code right, position: 5
Applied noise in crc32 code, position: 21
Encoded bit string: 0110011
Hamming encoded left: 0110011
Hamming encoded right: 0110100
CRC32 Checksum: 011001100010010010101101011101011110110
0.891536
Applied noise in hamming code left, position: 0
Applied noise in hamming code right, position: 5
Applied noise in crc32 code, position: 9
Encoded bit string: 0110010
Hamming encoded left: 0110010
Hamming encoded right: 001001
CRC32 Checksum: 0111001010010001111100001001100010100
0.394802
Applied noise in hamming code left, position: 0
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 21
Encoded bit string: 0110001
Hamming encoded left: 0110011
Hamming encoded right: 000011
CRC32 Checksum: 011000010110111110101000110100011111011
0.844174
Encoded bit string: 01101110
Hamming encoded left: 0110011
Hamming encoded right: 1110000
CRC32 Checksum: 0110110110101011011100001011000010101
0.753215
Encoded bit string: 01100100
Hamming encoded left: 0110011
Hamming encoded right: 0101010
CRC32 Checksum: 011001001110010101101101010110010000
0.322238
Applied noise in hamming code left, position: 0
Applied noise in hamming code right, position: 5
Applied noise in crc32 code, position: 14
Encoded bit string: 01100101
Hamming encoded left: 0110011
Hamming encoded right: 0101101
CRC32 Checksum: 0110010100101101101101000110011011110
0.921562
```

```
There is an error in the position 0
Corrected message is: 001001
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0110100
Hamming Right must be corrected, this is the new hamming: 001001
Received Hamming Code Left: 0110011 Received Hamming Code Right: 000011
Received CRC32 Code: 0110000101010111101000110000111110
Correct checksum
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 000011
Received Hamming Code Left: 0110011 Received Hamming Code Right: 1110000
Received CRC32 Code: 0110110101010101100001011000010101
Correct checksum
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 1110000
Hamming message is: ocoqan
CRC32 message is: ocoqan
Received Hamming Code Left: 1110011 Received Hamming Code Right: 0101000
Received CRC32 Code: 01100100111000010101010100110010000
Incorrect checksum
There is an error in the position 0
Corrected message is: 0110011
There is an error in the position 5
Corrected message is: 0101010
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0110011
Hamming Right must be corrected, this is the new hamming: 0101010
Received Hamming Code Left: 0110011 Received Hamming Code Right: 010101
Received CRC32 Code: 01100101001101101101000110011011110
Correct checksum
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 0101010
Hamming message is: de
CRC32 message is: de
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 6
```

Test 2

The image shows a Windows desktop with two terminal windows. The left window, titled 'emisor.cpp 1' and 'receptor.py 2', shows the execution of a C++ program 'emisor' which sends a hamming code. The right window, titled 'receptor.py 2', shows the execution of a Python script 'receptor.py' which receives the hamming code and successfully decodes it. Both windows show the same sequence of operations: encoding a message, adding noise, and decoding it back to the original message.

```
File Edit Selection View Go Run Terminal Help
Reides-2024-lab2 (Container debian debian)

emisor.cpp 1  receptor.py M X
receptor.py 2...

129 def main():
PROBLEMS OUTPUT TERMINAL PORTS GITLINS XRTDS COMMENTS DEBUG CONSOLE

Hamming encoded right: 01010101
CRC32 Checksum: 0110010110011011101101000011001101111110
0.897692
Encoded bit string: 0100011
Hamming encoded left: 0100011
Hamming encoded right: 0011110
CRC32 Checksum: 011000111110101011000001010100001100110
0.524548
Encoded bit string: 0100001
Hamming encoded left: 0100011
Hamming encoded right: 0000111
CRC32 Checksum: 01100001011011111011000011000011111110
0.8582644
Applied noise in hamming code left, position: 5
Applied noise in hamming code right, position: 2
Applied noise in crc32 code, position 0
Encoded bit string: 0110010
Hamming encoded left: 010100
Hamming encoded right: 0011001
CRC32 Checksum: 011100101001000111110000100111000110010
0.100365
Applied noise in hamming code left, position: 6
Applied noise in hamming code right, position: 0
Applied noise in crc32 code, position: 10
Encoded bit string: 0101000
Hamming encoded left: 010100
Hamming encoded right: 0101010
CRC32 Checksum: 011101001111111010001011010100101100
0.907241
Encoded bit string: 0101111
Hamming encoded left: 0101001
Hamming encoded right: 0011111
CRC32 Checksum: 010111111111111010000110101011110011
0.163655
Applied noise in hamming code left, position: 0
Applied noise in hamming code right, position: 4
Applied noise in crc32 code, position: 27
Encoded bit string: 0101010
Hamming encoded left: 0100011
Hamming encoded right: 1111000
CRC32 Checksum: 01011011010101011100001011000010101
0.400257
Applied noise in hamming code left, position: 1
Applied noise in hamming code right, position: 6
Applied noise in crc32 code, position: 31
root@890be159c4a:/Reides-2024-lab2/output#

Checksum failed
Hamming Left must be corrected, this is the new hamming: 0100011
Hamming Right must be corrected, this is the new hamming: 0000111
Received Hamming Code Left: 0101010 Received Hamming Code Right: 1010010
Received CRC32 Code: 0111000101010001111100001001100010100
Incorrect checksum
There is an error in the position 6
Corrected message is: 0101000
There is an error in the position 0
Corrected message is: 0010001
Checksum failed
Hamming Left must be corrected, this is the new hamming: 010100
Hamming Right must be corrected, this is the new hamming: 001001
Received Hamming Code Left: 0101000 Received Hamming Code Right: 0101010
Received CRC32 Code: 011001001111111001000010101010100100
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 010100
Accepted Hamming Right: 0101010
Received Hamming Code Left: 1110011 Received Hamming Code Right: 1110011
Received CRC32 Code: 010111101111111010000010000101110101
Incorrect checksum
There is an error in the position 0
Corrected message is: 0100011
There is an error in the position 4
Corrected message is: 1111111
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0100011
Hamming Right must be corrected, this is the new hamming: 1111111
Received Hamming Code Left: 0010011 Received Hamming Code Right: 1110001
Received CRC32 Code: 0101101101010101011100001011000010101
Incorrect checksum
There is an error in the position 1
Corrected message is: 0100011
There is an error in the position 6
Corrected message is: 1110000
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0100011
Hamming Right must be corrected, this is the new hamming: 1110000
Hamming message is: myguayopydecarton
CRC32 message is: myguayopydecarton
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 17
root@890be159c4a:/Reides-2024-lab2#
```

Test 3

```
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 (Container debian (debian))

emisor.cpp 1 receptor.py M X
receptor.py > ...
129 def main():
130     # Emisor
131     Enter a buffer: emisor
132     Encoded bit string: 01100101
133     Hamming encoded left: 0110011
134     Hamming encoded right: 0101101
135     CRC32 Checksum: 011001011001101110110100011001101111110
136     0.520872
137     Encoded bit string: 01101101
138     Hamming encoded left: 0110011
139     Hamming encoded right: 1100110
140     CRC32 Checksum: 011010011011000110011011000000111001100011
141     0.430984
142     Applied noise in hamming code left, position: 5
143     Applied noise in hamming code right, position: 6
144     Applied noise in crc32 code, position: 13
145     Encoded bit string: 01101001
146     Hamming encoded left: 0110011
147     Hamming encoded right: 1001100
148     CRC32 Checksum: 01101001101000100001010010011011100011
149     0.509436
150     Encoded bit string: 0110011
151     Hamming encoded left: 0110100
152     Hamming encoded right: 0011110
153     CRC32 Checksum: 011001111111000111100011010010101101101010
154     0.772136
155     Encoded bit string: 01101111
156     Hamming encoded left: 0110011
157     Hamming encoded right: 1111111
158     CRC32 Checksum: 01101111011111111010000110101101111011
159     0.698549
160     Encoded bit string: 01110010
161     Hamming encoded left: 0110100
162     Hamming encoded right: 0011001
163     CRC32 Checksum: 01110010100100011111000010011000110100
164     0.662665
165 root@88be159c8da:~/Redes-2024-lab2/output# ./emisor

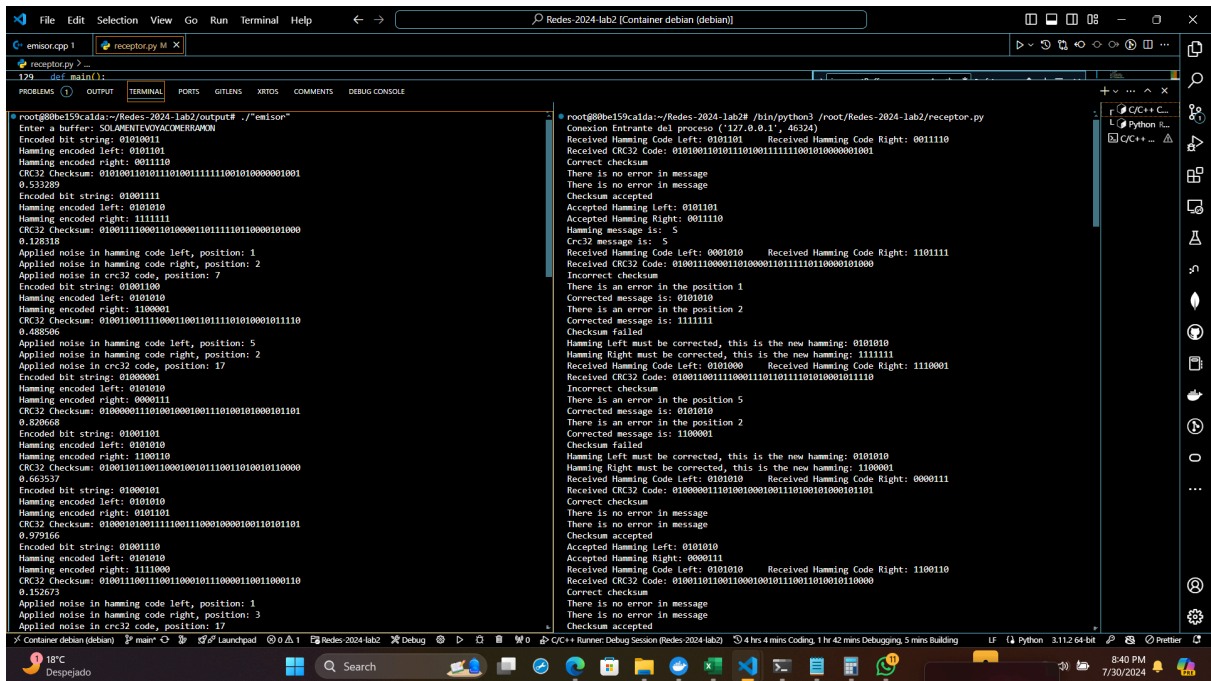
root@88be159c8da:~/Redes-2024-lab2 /bin/python3 /root/Redes-2024-lab2/receptor.py
Conexion Entrante del proceso (127.0.0.1, 36990)
Received Hamming Code Left: 0110011 Received Hamming Code Right: 0101101
Received CRC32 Code: 01100101100110111011010001100110111110
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 0101101
Hamming message is: e
Crc32 message is: e
Received Hamming Code Left: 0110001 Received Hamming Code Right: 1100111
Received CRC32 Code: 01101010011100101011000000111001100011
Incorrect checksum
There is an error in the position 5
Corrected message is: 0110011
There is an error in the position 6
Corrected message is: 1100110
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0110011
Hamming Right must be corrected, this is the new hamming: 1100110
Received Hamming Code Left: 0110011 Received Hamming Code Right: 1001100
Received CRC32 Code: 01100101101000100001010010011011100011
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 1001100
Received Hamming Code Left: 0110100 Received Hamming Code Right: 0011110
Received CRC32 Code: 011100111111000111101001010110101010
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110100
Accepted Hamming Right: 0011110
Received Hamming Code Left: 0110011 Received Hamming Code Right: 1111111
Received CRC32 Code: 0110111101111111101000110101101111011
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 1111111
Hamming message is: e
Crc32 message is: e
Amount of Stream Buffers (Buffers Sent): 3
Amount of letters with errors: 1
root@88be159c8da:~/Redes-2024-lab2/output#
```

```
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 (Container debian (debian))

emisor.cpp 1 receptor.py M X
receptor.py > ...
129 def main():
130     # Emisor
131     Enter a buffer: emisor
132     Encoded bit string: 01100101
133     Hamming encoded left: 0110011
134     Hamming encoded right: 0101101
135     CRC32 Checksum: 011001011001101110110100011001101111110
136     0.520872
137     Encoded bit string: 01101101
138     Hamming encoded left: 0110011
139     Hamming encoded right: 1100110
140     CRC32 Checksum: 011010011011000110011011000000111001100011
141     0.430984
142     Applied noise in hamming code left, position: 5
143     Applied noise in hamming code right, position: 6
144     Applied noise in crc32 code, position: 13
145     Encoded bit string: 01101001
146     Hamming encoded left: 0110011
147     Hamming encoded right: 1001100
148     CRC32 Checksum: 01101001101000100001010010011011100011
149     0.509436
150     Encoded bit string: 0110011
151     Hamming encoded left: 0110100
152     Hamming encoded right: 0011110
153     CRC32 Checksum: 011001111111000111100011010010101101101010
154     0.772136
155     Encoded bit string: 01101111
156     Hamming encoded left: 0110011
157     Hamming encoded right: 1111111
158     CRC32 Checksum: 01101111011111111010000110101101111011
159     0.698549
160     Encoded bit string: 01110010
161     Hamming encoded left: 0110100
162     Hamming encoded right: 0011001
163     CRC32 Checksum: 01110010100100011111000010011000110100
164     0.662665
165 root@88be159c8da:~/Redes-2024-lab2/output#

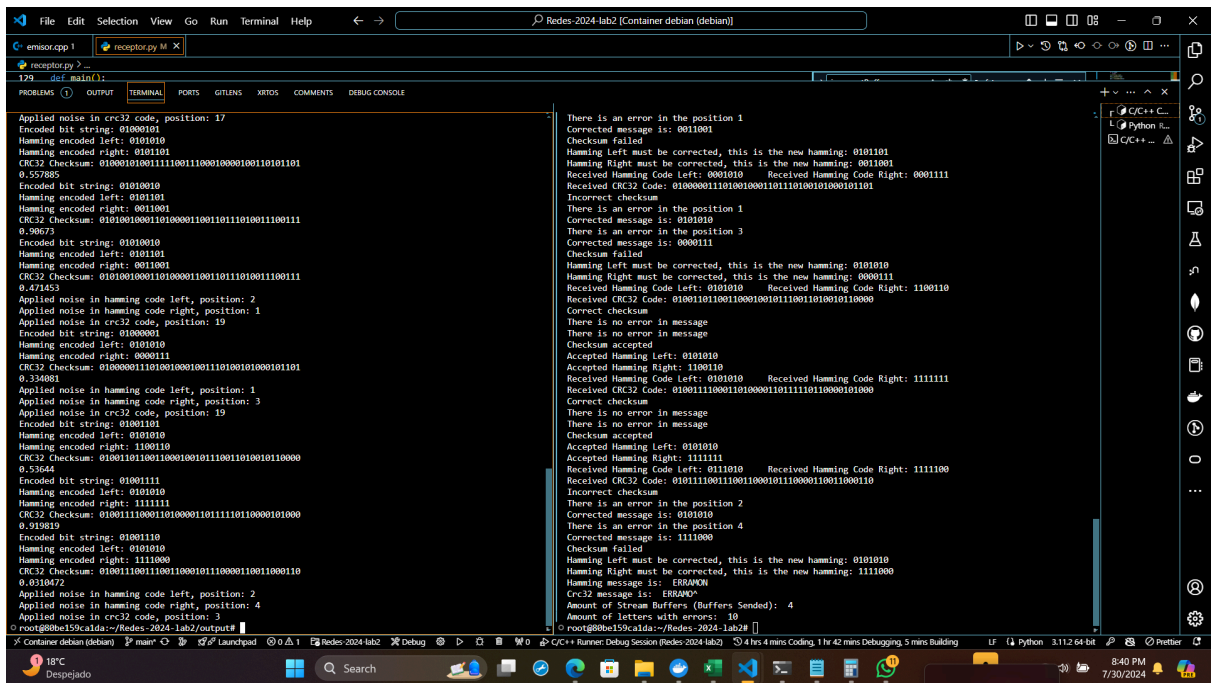
There is an error in the position 5
Corrected message is: 0110011
There is an error in the position 6
Corrected message is: 1100110
Checksum failed
Hamming Left must be corrected, this is the new hamming: 0110011
Hamming Right must be corrected, this is the new hamming: 1100110
Received Hamming Code Left: 0110011 Received Hamming Code Right: 1001100
Received CRC32 Code: 01101001101000100001010010011011100011
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 1001100
Received Hamming Code Left: 0110100 Received Hamming Code Right: 0011110
Received CRC32 Code: 011100111111000111101001010110101010
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110100
Accepted Hamming Right: 0011110
Received Hamming Code Left: 0110011 Received Hamming Code Right: 1111111
Received CRC32 Code: 01101111011111111010000110101101111011
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110011
Accepted Hamming Right: 1111111
Hamming message is: miso
Crc32 message is: miso
Received Hamming Code Left: 0110100 Received Hamming Code Right: 0011001
Received CRC32 Code: 01110010100100011111000010011000110100
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
Accepted Hamming Left: 0110100
Accepted Hamming Right: 0011001
Hamming message is: r
Crc32 message is: r
Amount of Stream Buffers (Buffers Sent): 3
Amount of letters with errors: 1
root@88be159c8da:~/Redes-2024-lab2/output#
```

Test 4



```
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 (Container debian (debian))

emisor.cpp 1 receptor.py M X
receptor.py > ...
129 def main():
130     # root@80be159caida:~/Redes-2024-lab2/output# ./emisor
Enter a buffer: SOLAMENTEVOYACOMERARAPON
Encoded bit string: 01010011
Hamming encoded left: 0101101
Hamming encoded right: 0011110
CRC32 Checksum: 0101001101011101001111110101000001001
0.53209
Encoded bit string: 01001111
Hamming encoded left: 0101010
Hamming encoded right: 1111111
CRC32 Checksum: 010011100001101000011011110110000101000
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: 0101010
Hamming encoded left: 0101010
Hamming encoded right: 1100001
CRC32 Checksum: 01001100111000011001110110101000101110
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: 0100001
Hamming encoded left: 0101010
Hamming encoded right: 0000111
CRC32 Checksum: 010000111010100010011011010100010101
0.820668
Encoded bit string: 01001101
Hamming encoded left: 0101010
Hamming encoded right: 1100110
CRC32 Checksum: 0100110101001000101011100110101010000
0.635337
Encoded bit string: 01000101
Hamming encoded left: 0101010
Hamming encoded right: 0101101
CRC32 Checksum: 01000100011110011000100001001010101
0.979166
Encoded bit string: 01001110
Hamming encoded left: 0101010
Hamming encoded right: 1111000
CRC32 Checksum: 0100111001100010010110000110011000110
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@80be159caida:~/Redes-2024-lab2/output# ./receptor.py
Conexion Entrante del proceso (127.0.0.1, 46324)
Received Hamming Code Left: 0101101 Received Hamming Code Right: 0011110
Received CRC32 Code: 0101001101011101001111110101000001001
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: 5
Crc32 message is: 5
Received Hamming Code Left: 0001010 Received Hamming Code Right: 1101111
Received CRC32 Code: 010011100001101000011011110110000101000
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: 1100001
Received CRC32 Code: 010011001110001110110110101000101110
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: 0000111
Received CRC32 Code: 0100000111010100010011101010100010101
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: 010011011000100010111001101001010000
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: 010011011000100010111001101001010000
Correct checksum
There is no error in message
There is no error in message
Checksum accepted
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: 01000001110100100011011101010100010101
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: 01001101001100010010111001101001010000
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: 010011100001101000011011110110000101000
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: 010111000111001100010110000110011000110
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: ERRAPON
Crc32 message is: ERRAPON
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 10
root@80be159caida:~/Redes-2024-lab2/output#
```



```
File Edit Selection View Go Run Terminal Help
Redes-2024-lab2 (Container debian (debian))

emisor.cpp 1 receptor.py M X
receptor.py > ...
129 def main():
130     # root@80be159caida:~/Redes-2024-lab2/output# ./emisor
Enter a buffer: SOLAMENTEVOYACOMERARAPON
Encoded bit string: 01010011
Hamming encoded left: 0101101
Hamming encoded right: 0011110
CRC32 Checksum: 0101001101011101001111110101000001001
0.53209
Encoded bit string: 01001111
Hamming encoded left: 0101010
Hamming encoded right: 1111111
CRC32 Checksum: 010011100001101000011011110110000101000
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: 0101010
Hamming encoded left: 0101010
Hamming encoded right: 1100001
CRC32 Checksum: 01001100111000011001110110101000101110
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: 0100001
Hamming encoded left: 0101010
Hamming encoded right: 0000111
CRC32 Checksum: 010000111010100010011011010100010101
0.820668
Encoded bit string: 01001101
Hamming encoded left: 0101010
Hamming encoded right: 1100110
CRC32 Checksum: 0100110101001000101011100110101010000
0.635337
Encoded bit string: 01000101
Hamming encoded left: 0101010
Hamming encoded right: 0101101
CRC32 Checksum: 01000100011110011000100001001010101
0.979166
Encoded bit string: 01001110
Hamming encoded left: 0101010
Hamming encoded right: 1111000
CRC32 Checksum: 0100111001100010010110000110011000110
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@80be159caida:~/Redes-2024-lab2/output# ./receptor.py
Conexion Entrante del proceso (127.0.0.1, 46324)
Received Hamming Code Left: 0101101 Received Hamming Code Right: 0011110
Received CRC32 Code: 0101001101011101001111110101000001001
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: 5
Crc32 message is: 5
Received Hamming Code Left: 0001010 Received Hamming Code Right: 1101111
Received CRC32 Code: 010011100001101000011011110110000101000
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: 1100001
Received CRC32 Code: 010011001110001110110110101000101110
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: 0000111
Received CRC32 Code: 0100000111010100010011101010100010101
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: 010011011000100010111001101001010000
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: 010011100001101000011011110110000101000
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: 010111000111001100010110000110011000110
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: ERRAPON
Crc32 message is: ERRAPON
Amount of Stream Buffers (Buffers Sended): 4
Amount of letters with errors: 10
root@80be159caida:~/Redes-2024-lab2/output#
```

Test 5

Test 6

```
root@80be159calda:~/Redes-2024-lab2/output# ./"emisor"
Enter a buffer: 1234567890
Encoded bit string: 00110001
Hamming encoded left: 0011110
Hamming encoded right: 0000111
CRC32 Checksum: 001100010101011110101000100110000010011
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: 001100101011110000101000101000001010001
0.566007
Encoded bit string: 00110011
Hamming encoded left: 0011110
Hamming encoded right: 0011110
CRC32 Checksum: 001100111010101001001000100000010111111
0.58875
Encoded bit string: 00110100
Hamming encoded left: 0011110
Hamming encoded right: 0101010
CRC32 Checksum: 00110100101010010111100100011101101001001
0.970978
Encoded bit string: 00110101
Hamming encoded left: 0011110
Hamming encoded right: 0101011
CRC32 Checksum: 0011010110110111111110110110110100111
0.902416
Encoded bit string: 00110110
Hamming encoded left: 0011110
Hamming encoded right: 0110011
CRC32 Checksum: 001101101010100000111110111000111010001
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: 00110111001110010110010000001100111111
0.607744
Encoded bit string: 00111000
Hamming encoded left: 0011110
Hamming encoded right: 1001011
Hamming encoded right: 1001011

root@80be159calda:~/Redes-2024-lab2# /bin/python3 /root/Redes-2024-lab2/receptor.py
Conexion Entrante del proceso ('127.0.0.1', 60160)
Received Hamming Code Left: 00101010 Received Hamming Code Right: 0001111
Received CRC32 Code: 00110001010101110101000100111000010011
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: 0011001010111100001010001010000001010001
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: 001100111010101001000100000001011111
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: 0011010011010010111001000110110101001001
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: 0101010
Received CRC32 Code: 0011010110111011111110110110110100111
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: 0101010
Received CRC32 Code: 001101011011101111111110110110110100111
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: 00110100101001001011100100011101100011101001001
0.970978
Encoded bit string: 00110101
Hamming encoded left: 0011110
Hamming encoded right: 0101011
CRC32 Checksum: 0011010110110111111110110110110100111
0.902416
Encoded bit string: 00110110
Hamming encoded left: 0011110
Hamming encoded right: 0110011
CRC32 Checksum: 0011011010100000111110111000111010001
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: 00110111001110010110010000001100111111
0.607744
Encoded bit string: 00111000
Hamming encoded left: 0011110
Hamming encoded right: 1001011
CRC32 Checksum: 0011100010011000010000100100010111010100
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: 001110011111000101001110101001010011010
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: 0011000000111110101001000111100011001001
0.96031

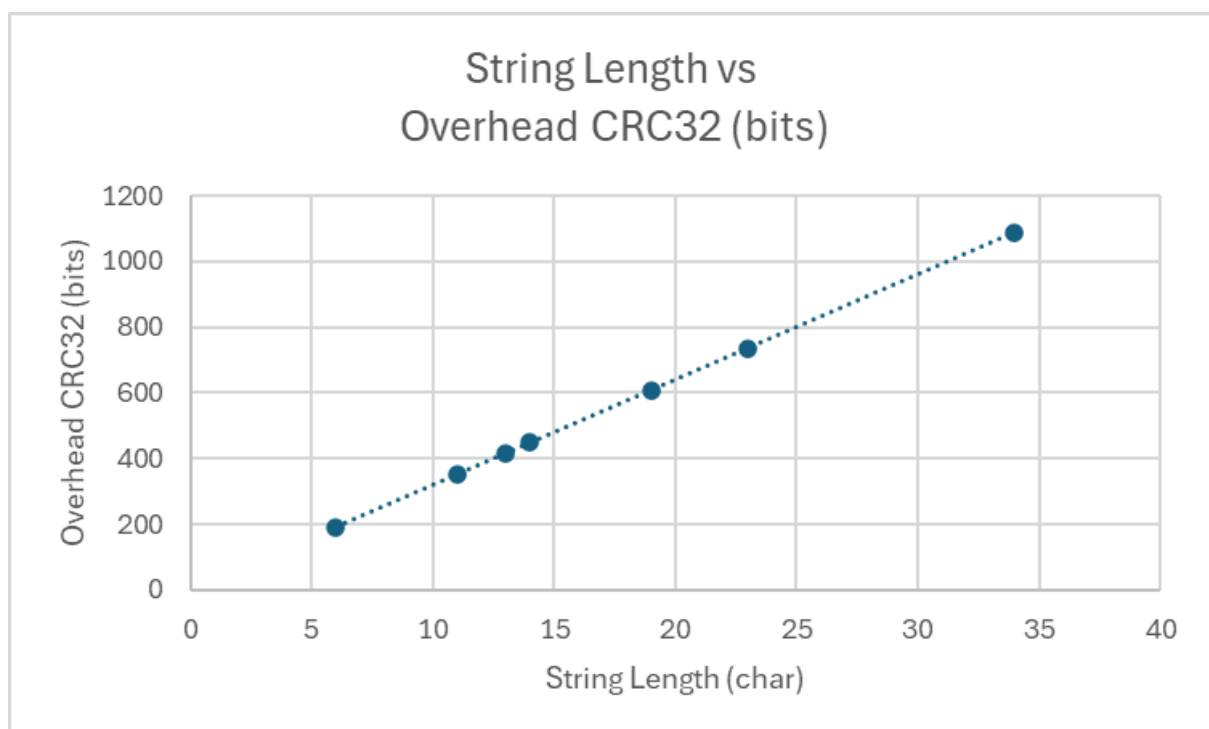
root@80be159calda:~/Redes-2024-lab2/output#

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: 001101100110001011001000000100111111
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: 0011000100110000100100100010111010100
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: 0011100111110001010011101010010000111010
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: 0011000000111110101001000111100011001001
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

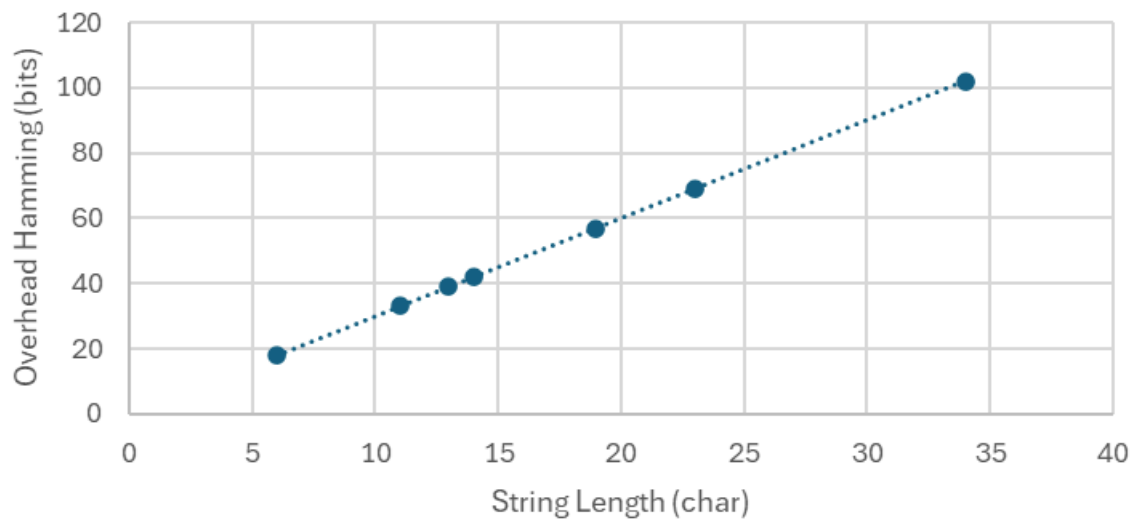
root@80be159calda:~/Redes-2024-lab2#
```

Results

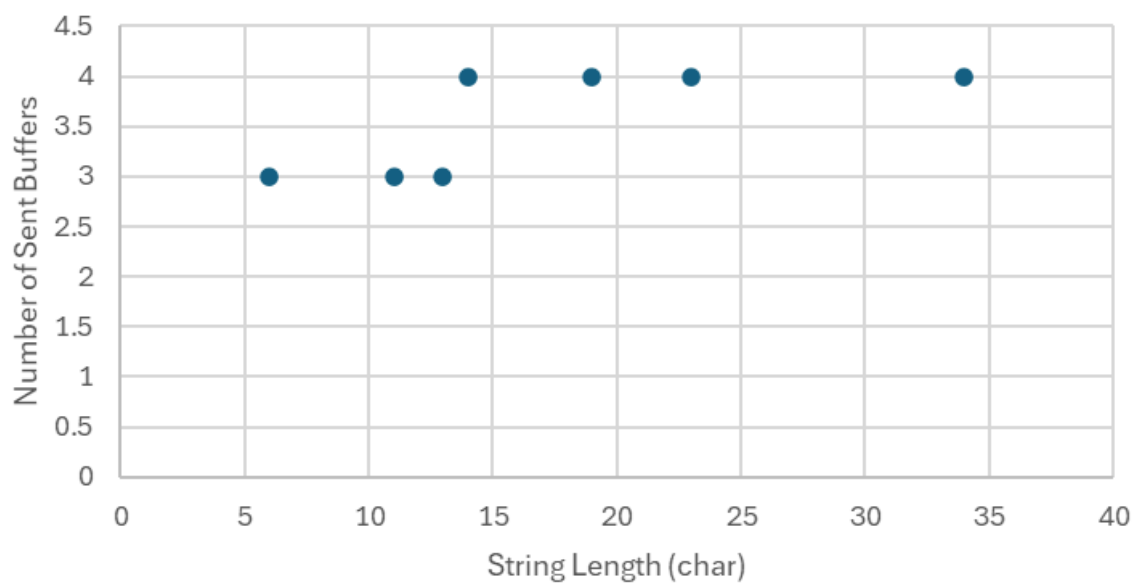
Chain	String Length (Char)	# of Sent Buffers	Overhead Hamming (bits)	Overhead CRC32 (bits)	Number of letters with Errors	Percent Error
ellorocogrande	14	4	42	448	6	42.86%
pinponesunmunieco muyguapoydecarton	34	4	102	1088	17	50.00%
RaulSeleccion	13	3	39	416	7	53.85%
emisor	6	3	18	192	1	16.67%
SOLAMENTEVOYA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

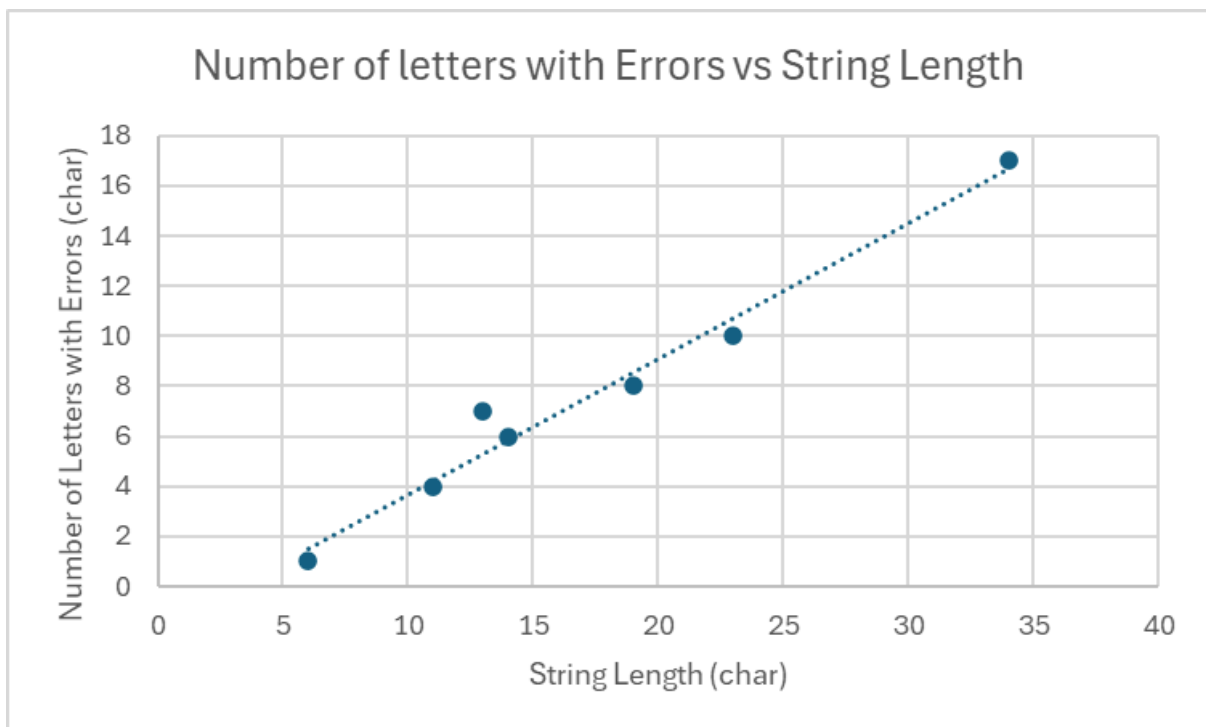
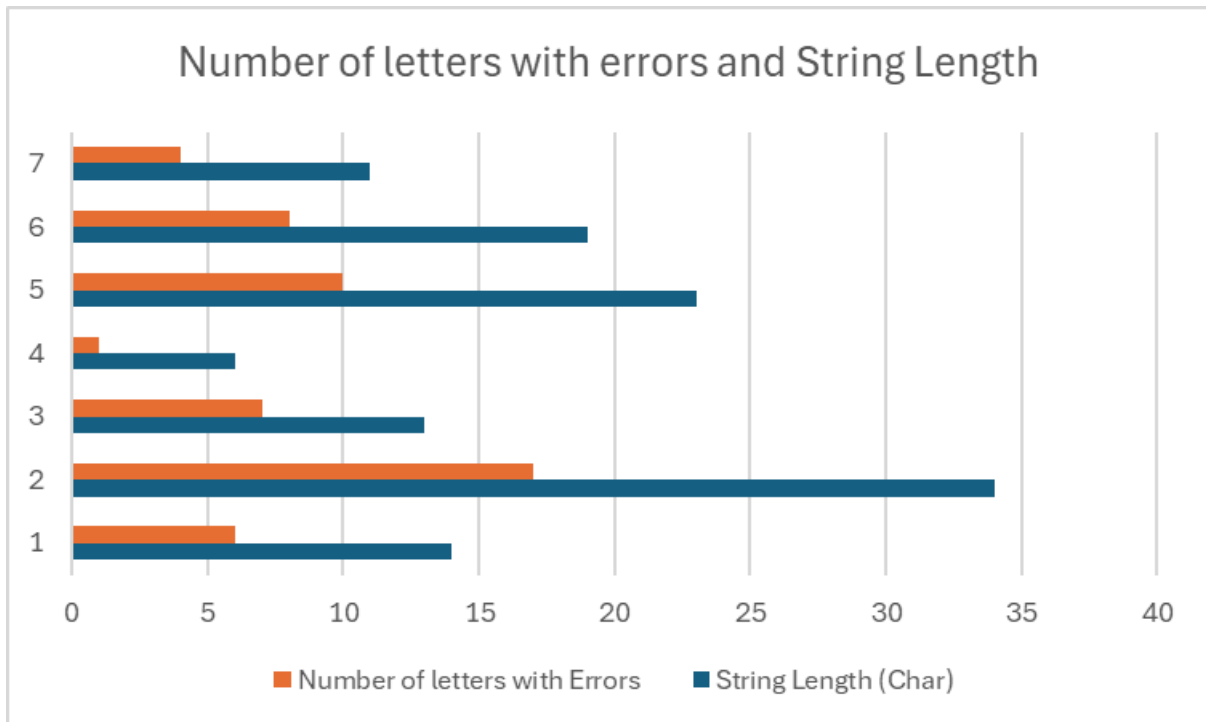


String Length vs
Overhead Hamming (bits)



Number of Sent Buffers vs String Length





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.