

1- Task:

This project is concerned with generation of ethernet frames restricted with specific standards and specific configurations.

2- Goal:

Maintainable reusable project that can be modified and used again for additional standards.

3- Frame Description:

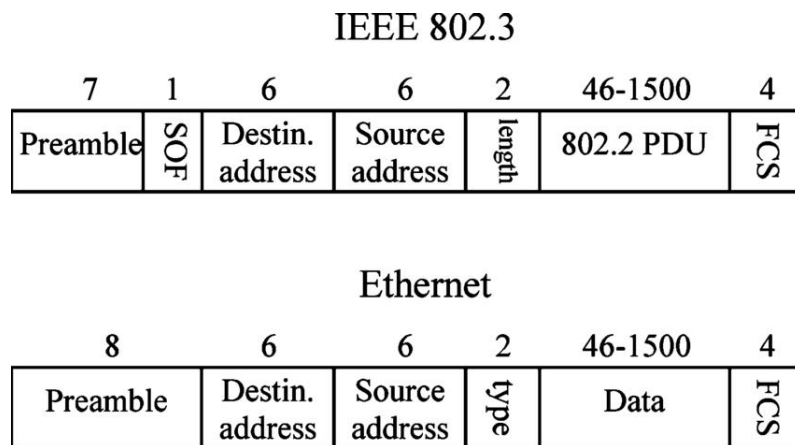


Figure 1 Ethernet and IEEE802.3 standards

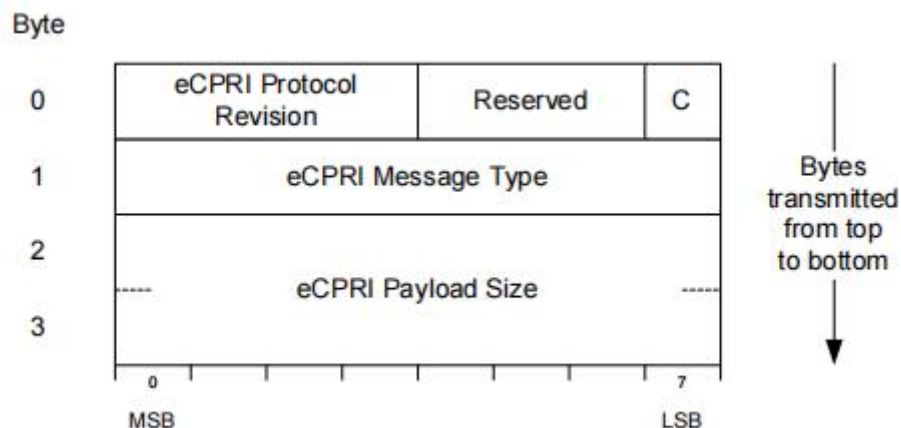


Figure 2 Ecpri frame header

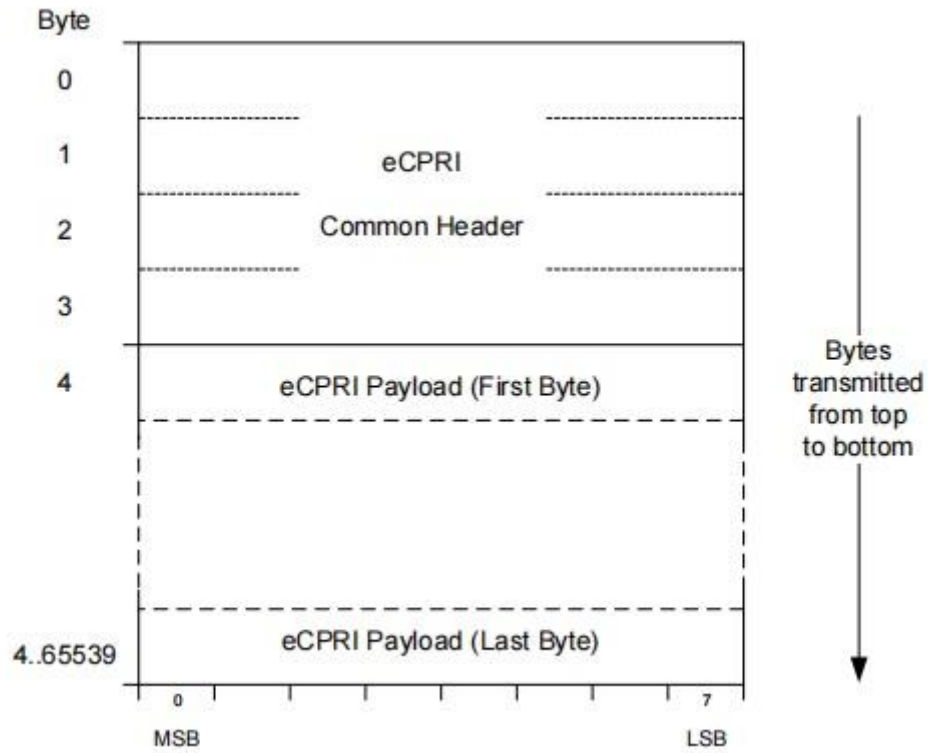


Figure 3 EcprI Frame description

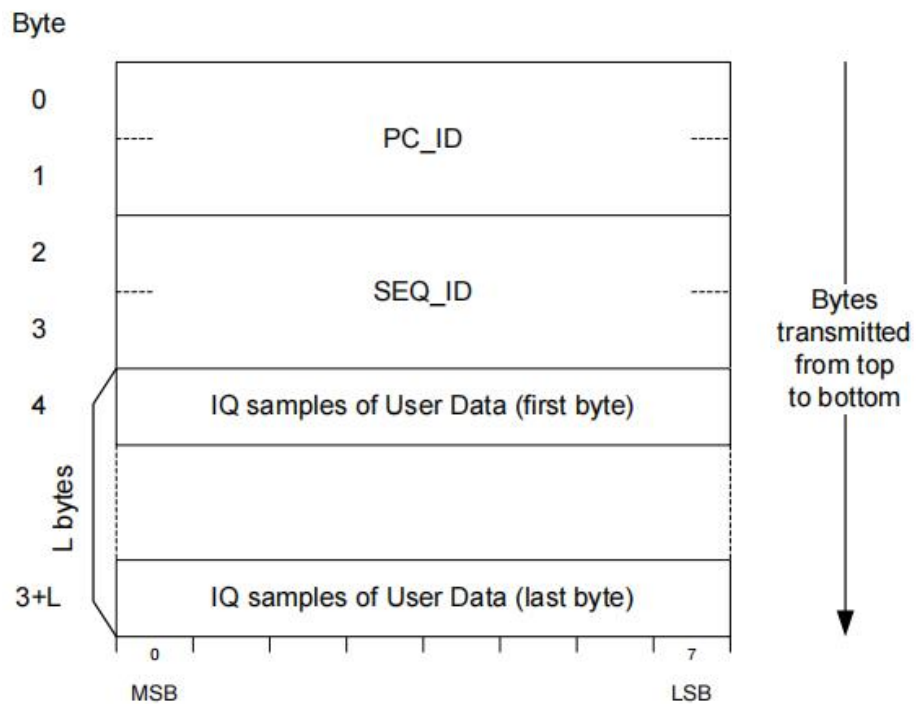


Figure 4 Message type#0 description

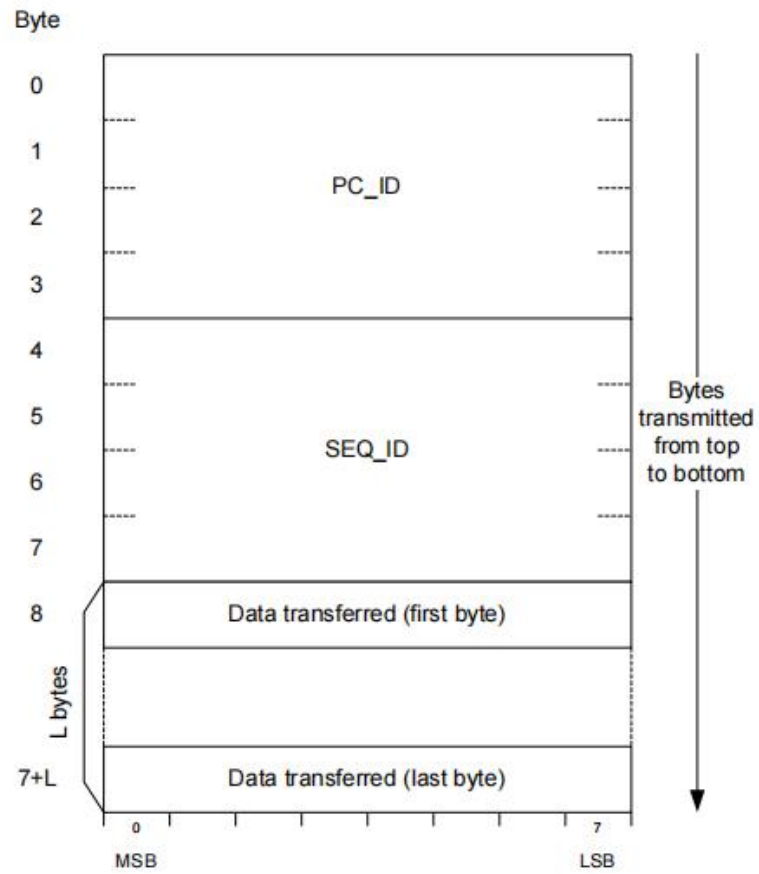


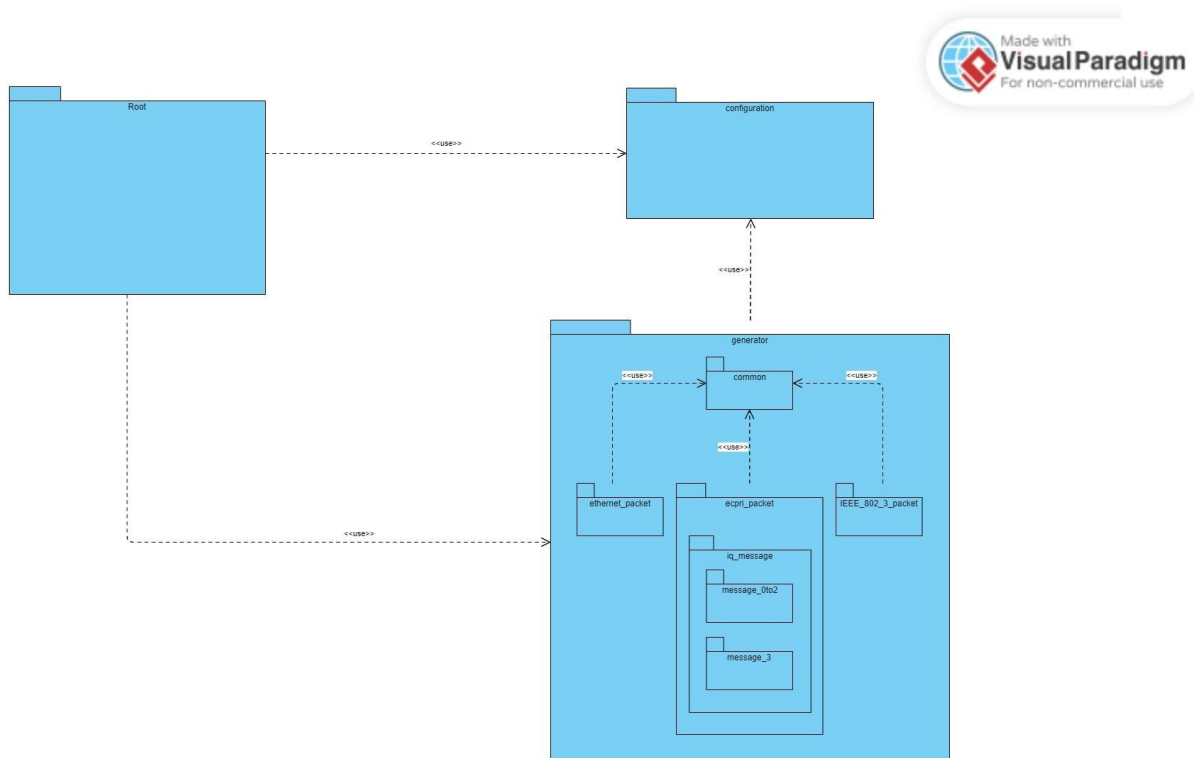
Figure 5 Message type #3 description

4- Paradigm :

The whole project can follow procedural approach which means it can be one source code of procedures happening one after another .

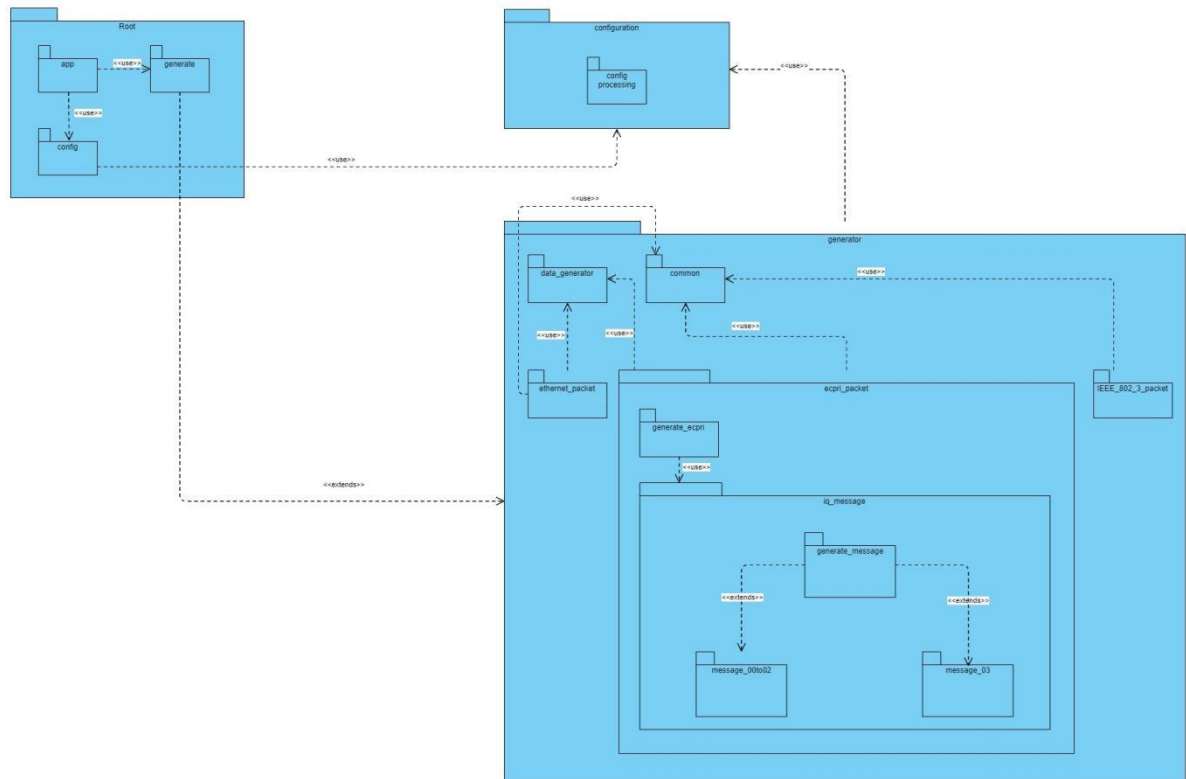
But OOP was used here in order to achieve SOLID principles and make it more maintainable.

5- High Level Package Diagram :



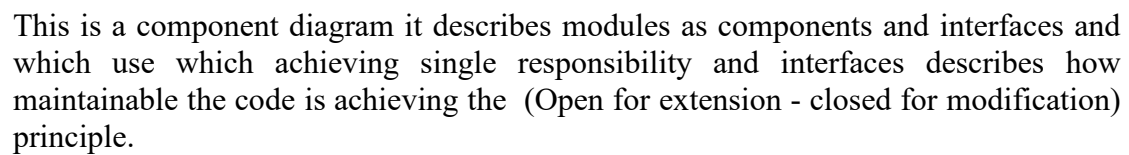
This is a High Level Package Diagram which represents how code is divided into packages and how these packages interact with each other.

6- Low Level Package Diagram :



This is a Low Level Package Diagram that describes in depth how packages use each other and what specific module it uses in the other package.

Made with **Visual Paradigm**
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8- Test Cases :

I. Ethernet Frame :

1)

- Random size ethernet frame.
- Frame size is ranged between minimum size (72) and maximum packet (426) that can be transferred without any data losses.
- No data loss but spare packets in bursts are transformed into ifgs depending on their size and they are of multiple of 4.

```

; ----- Ethernet frame

```

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
SOURCE_ADDRESS = 0x102030405060
DESTINATION_ADDRESS = 0x102030302010
ETHER_TYPE = 0x0800
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 426
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
```

[illegible]

2)

- Fixed size ethernet frame.

- Frame size is fixed and its packet size is (426) that can be transferred without losing data.

- No data loss and packets perfectly fits burst periodicity.

; ----- Ethernet frame

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
SOURCE_ADDRESS = 0x102030405060
DESTINATION_ADDRESS = 0x102030302010
ETHER_TYPE = 0x0800
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 426
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
```

```
import struct
import random

def generate_data(min_data_size,max_data_size) :
    data_size = random.randint(min_data_size,max_data_size)
    data = b''.join([struct.pack('B', random.randint(0, 255)) for _ in range(400)])
    return data,400
```

```
packets - Notepad
File Edit Format View Help
aaaaaaaaaaaaab102030302010102030405060080003ca859173d2a9551340dc288e220781be969c3f69e0451b4044b967a66b4624f31041567afa4d5ead
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600800c1a514be46f93342beb5509d4be45bac26c161eebf13660d9c7cd398603e8c77883b2dc0a17fa171ae
303030303030303030303030
aaaaaaaaaaaaab10203030201010203040506008002104dae3ba58082f7010392bafaf446e2209bddd7f756f0e60defa7d4be0b237e0cac4389e5a0c21b7
303030303030303030303030
aaaaaaaaaaaaab102030302010102030405060080019db245008c8c47219e4a39059c0da0116d25e679ba0f1f11cd28f06f3ea4f357686e4970c2a9570c7
303030303030303030303030
aaaaaaaaaaaaab10203030201010203040506008002b07357198a026ec6b358862c2a5db4151cda0a1f0ff838bcd4e7a13c6a8dec7f34418817be96697a4
303030303030303030303030
aaaaaaaaaaaaab10203030201010203040506008005f7f07dbf68863ef5416adab4aa29549a44f93f06d3dfe1817c9b17b43d673d43cd7aa04c44eddf681
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600800e7a4a39e76ec29f2548a61680f9b747cb4f9cddb6bc0c2dcec42efd6127401559f3d3acbbc80123b34
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600800806061cfc170b37b3e6c41bd1d1c3eb18ee43fc300128a23b939c6a5c3d4d6abb6b03a29645fcdc2d4
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600800b5ef560b62f40a89706fb53d667536641af90620ff072c82bec8e80460822297f9c735fea8c7479598
```


- Fixed size ethernet frame.

-2 packets are sent and there is constant loss of last packets every burst.

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
SOURCE_ADDRESS = 0x102030405060
DESTINATION_ADDRESS = 0x102030302010
ETHER_TYPE = 0x0800
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 426
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
```

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II. Ecpri Frame :

1)

- Ecpri frame of fixed size..
- Maximum packet size that can be transferred without loss is equal to ecpri frame (72).
- No data loss and packets sent perfectly fit the burst period.

```
; ----- ecpri frame
```

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
DESTINATION_ADDRESS = 0x102030302010
SOURCE_ADDRESS = 0x102030405060
ETHER_TYPE = 0xaeFe
PROTOCOL_VERSION= 1
CONCATENATION_INDICATOR = 0
MESSAGE_TYPE= 0x00
PAYLOAD_SIZE= 0x0014
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 72
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
PC_ID = 0x8068
SEQ_ID = 0x0780
```

[illegible]

- Ecpr frame of fixed size..

- Maximum packet size that can be transferred without loss is greater than ethernet frame (80).

- No data loss but a spare packet is transformed to ifgs.

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
DESTINATION_ADDRESS = 0x102030302010
SOURCE_ADDRESS = 0x102030405060
ETHER_TYPE = 0xaeef
PROTOCOL_VERSION= 1
CONCATENATION_INDICATOR = 0
MESSAGE_TYPE= 0x00
PAYLOAD_SIZE= 0x0014
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 80
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
PC_ID = 0x8068
SEQ_ID = 0x0780
```

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- Ecpri frame of fixed size.

- Constant packet loss every burst.

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
DESTINATION_ADDRESS = 0x102030302010
SOURCE_ADDRESS = 0x102030405060
ETHER_TYPE = 0xaeFe
PROTOCOL_VERSION= 1
CONCATENATION_INDICATOR = 0
MESSAGE_TYPE= 0x00
PAYLOAD_SIZE= 0x0014
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 60
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
PC_ID = 0x8068
SEQ_ID = 0x0780
```

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- Trying message type #2.

- Ecpri frame of fixed size.

- Maximum packet size that can be transferred without loss is equal to ecpri frame (72).

- Perfectly fit bursts and message type 2 is applied.

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGS = 0x30
DESTINATION_ADDRESS = 0x102030302010
SOURCE_ADDRESS = 0x102030405060
ETHER_TYPE = 0xaeFe
PROTOCOL_VERSION= 1
CONCATENATION_INDICATOR = 0
MESSAGE_TYPE= 0x02
PAYLOAD_SIZE= 0x0014
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 72
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
PC_ID = 0x8068
SEQ_ID = 0x0780
```

[illegible]

- Perfectly fit bursts and size is changed.

```
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
DESTINATION_ADDRESS = 0x102030302010
SOURCE_ADDRESS = 0x102030405060
ETHER_TYPE = 0xaeef
PROTOCOL_VERSION= 1
CONCATENATION_INDICATOR = 0
MESSAGE_TYPE= 0x00
PAYLOAD_SIZE= 0x001a
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 72
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
PC_ID = 0x8068
SEQ_ID = 0x0780
```

[illegible]

III. IEEE 802.3 Frame :

1)

- Fixed size IEEE 802.3 frame , size = ether_type = 0x0258 = 600.
- Frame size is fixed and it is equal to maximum packet size (626) that can be transferred.
- It perfectly fits the burst periodicity.

```
; ----- IEEE 802.3
[PACKET_CONFIG]
STREAM_DURATION_MS = 1
IFGs = 0x30
SOURCE_ADDRESS = 0x102030405060
DESTINATION_ADDRESS = 0x102030302010
ETHER_TYPE = 0x0258
PAYLOAD_TYPE = RANDOM
MAX_PACKET_SIZE = 626
BURST_SIZE = 3
BURST_PERIODICITY_US = 100
```



```
packets - Notepad
File Edit Format View Help
aaaaaaaaaaaaab10203030201010203040506002580a88f561e2d39cefcc413d2fe1d7008c811fb740c557d004dc0a7a07f5338d5766d21a10dfc794f26b
fd0a21759c0e9a0f6213b081c796e4e475aa07656dc754ae6d44d7eeccc3389df0e767b59d2d2411c905045d832d0815b21b70c603225ef2b71a02a07df6dc
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600258976b99b229088a7d70b41fa1240c3edcd9abd3ae408fdb61a30427a4fa8f883404ae2500c5f3d8f5dd
815dd6954c2824fdb4464b84ca68edf043a4f8b942e577e06a6d99290af53d310e6d89e8ee8adbaa076b70dc703251d815726503f0c531eb4ef193dabd57bb
303030303030303030303030
aaaaaaaaaaaaab10203030201010203040506002584878cfac8b1e9467fcdcf4ce594d246cd62f11501f5490b0cd8e7af56b6b54951411a93cd802175f56
af8295a792818f7244f6a6fcdaef3d88f0bc98e15247c2566482a6e754433273f590cfee1d2415a86b2bdc012f92fdec3da9ecf56b5008aba88f6cd22d7d4d
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600258140ead2312949d4cb4b483f73117cd488124120644789269c48c2a90c352e991657e717fe98b0c4c96
0287584333733bd229e2c5ad6c6664694ab93f0910ad2f112fc0362030927408f5076591d39c3f41c3ed7f52bb17ee5cccfc801af04aac25b8eac8de4b97e5c
303030303030303030303030
aaaaaaaaaaaaab1020303020101020304050600258c15a0e12dc7e1b58d85d91b3e2efe1e7b6a071cbd09db58c26089b6816cc150887f698e8a19d1f4879
2793a8059f4d0d0540ecd75ff88862cb1283eb2da2b36015b0c06457640da7b5b8775119cbf08aab64cc8b275cb7edc8fd68ed7c805c30b37475f7b887340
303030303030303030303030
aaaaaaaaaaaaab102030302010102030405060025839750e91c9d8ffd0623bfbd91f4bc2b33a66439b6189696824c085813a0c5451047b5b0e660b788888
1beb255c4158ab5cd91c8fcee83c8dc2bf0234cf0afa4247148a64089adfd3a491430e372e9d6d012774e7a7f942520845a9e493379d87ef89256cff3d05a
303030303030303030303030
```


- Fixed size IEEE 802.3 frame , size = ether_type = 0x0258 = 600.

- no data loss and spared packets are converted to ifgs.

[illegible]

