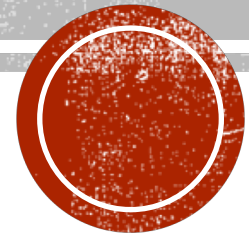


AGATA PROOF OF CONCEPT FUTURE ELECTRONICS

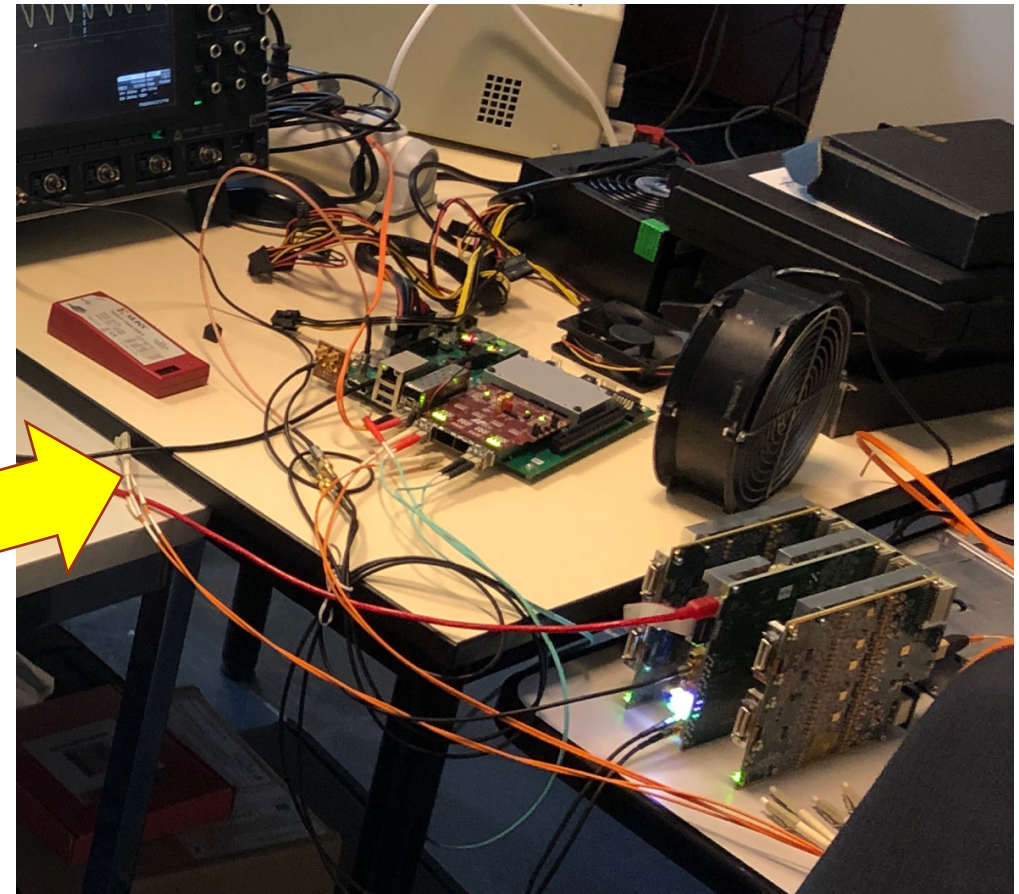
CSNSM-IFIC Valencia



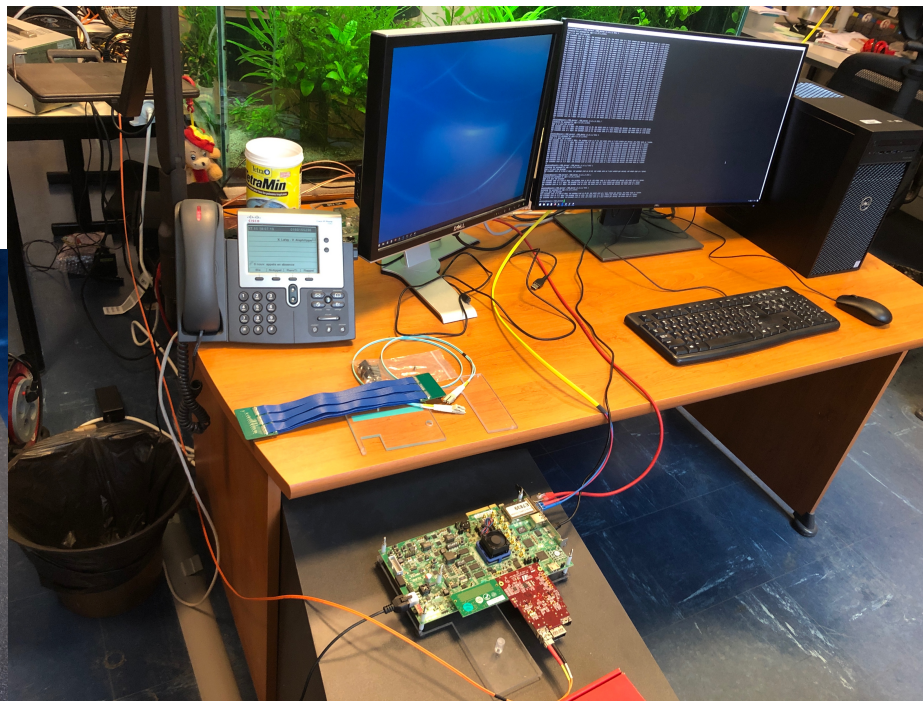
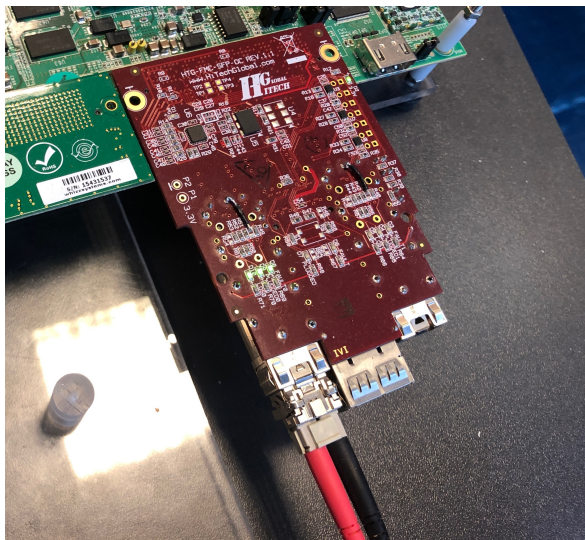
POC EXPERIMENT SETUP

- Hardware materials :
 - KCU105 evaluation board
 - VC709 evaluation board
 - Server to receive 10 Gbps
 - IFIC Test Bench composed of DIGIOPT, SOM and carrier evaluation boards, 2 laptops cables etc..

POC EXPERIMENT SETUP PRE-PROCESSING PROTOTYPE



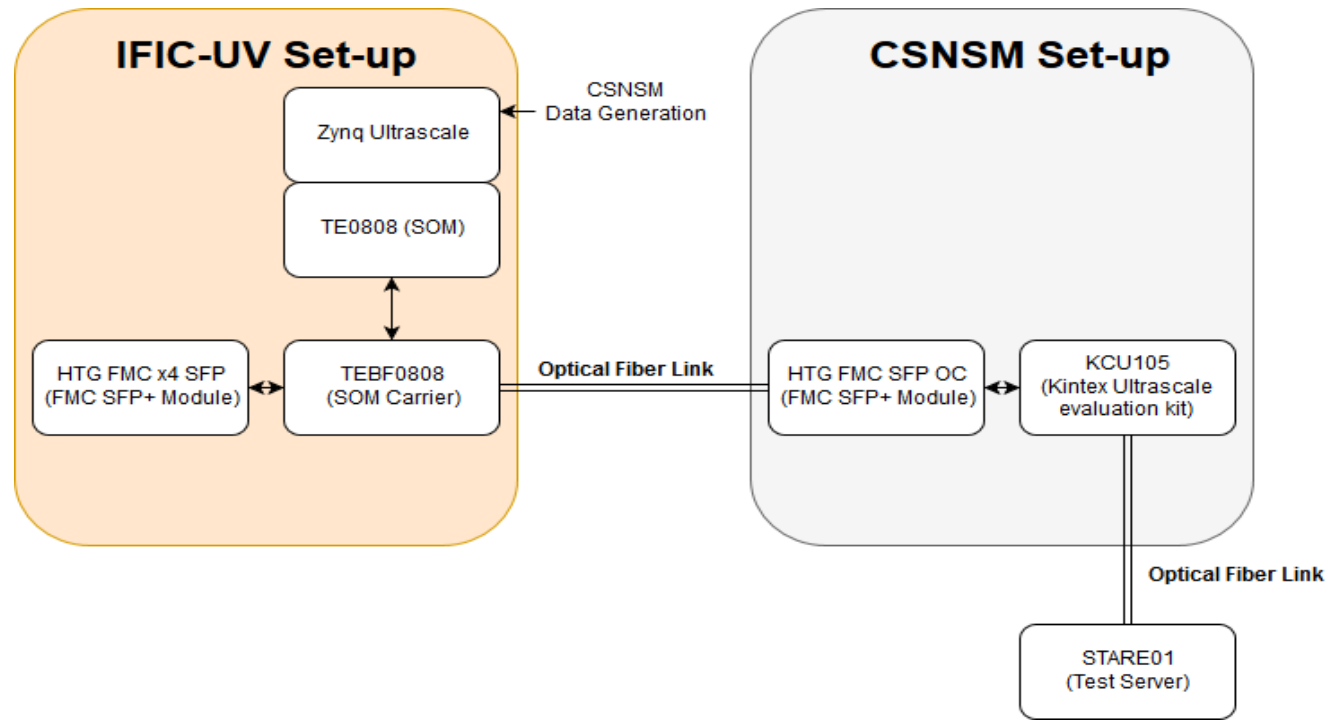
POC EXPERIMENT SETUP STARE PROTOTYPE



CSNSM Hardware

3 TYPES OF TESTS WERE MADE

- Gustav designed a firmware to simulate the pre-processing for the VC709 and KCU105. For the POC he designed a firmware for the IFIC evaluation board with the SOM KU040. The data was sent from the IFIC bench to the CSNSM bench.



CSNSM FIRMWARE SIMULATION

- 5 Gbps with 0% loss STARE01 event packages reception without writing to disk

[illegible]

CSNSM FIRMWARE SIMULATION

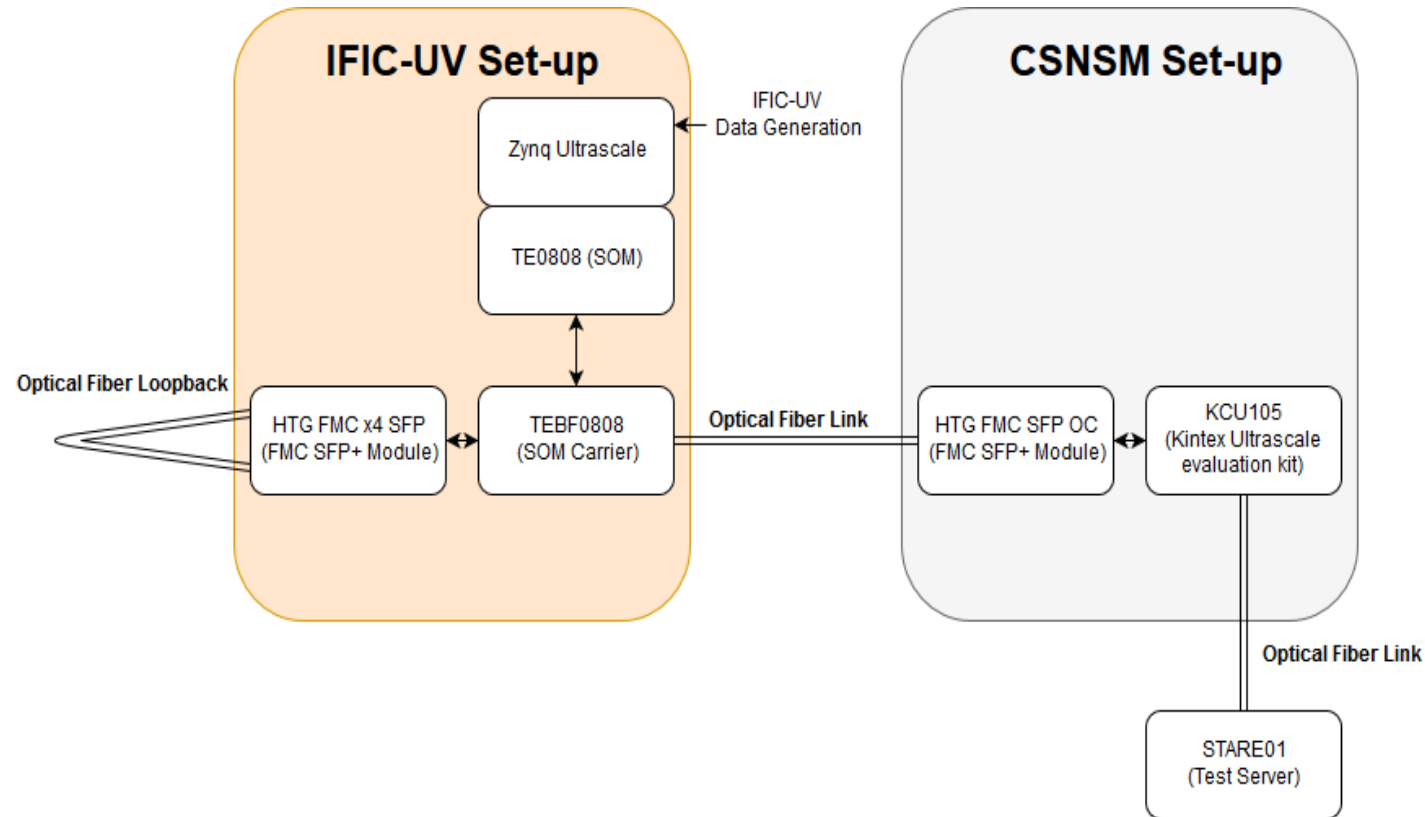
STARE01 event packages reception and writing to disk. Transfer rate decays and package loss rises as the sever struggles to receive data and write it to disk.

```
is 5.28e-15 Gbps, the package loss is 0%, the event rate is 0 kilo events per second, the event size is 0 bytes.  
is 4.97 Gbps, the package loss is 2.46%, the event rate is 301 kilo events per second, the event size is 2048 bytes.  
is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
is 5.08 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
is 3.84 Gbps, the package loss is 24.7%, the event rate is 232 kilo events per second, the event size is 2048 bytes.  
is 4.93 Gbps, the package loss is 3.2%, the event rate is 298 kilo events per second, the event size is 2048 bytes.  
is 4.77 Gbps, the package loss is 6.37%, the event rate is 288 kilo events per second, the event size is 2048 bytes.  
is 4.83 Gbps, the package loss is 5.04%, the event rate is 293 kilo events per second, the event size is 2048 bytes.  
is 4.15 Gbps, the package loss is 18.4%, the event rate is 251 kilo events per second, the event size is 2048 bytes.  
is 2.26 Gbps, the package loss is 55.4%, the event rate is 136 kilo events per second, the event size is 2048 bytes.
```

```
userelec@stare01:~/UDP_Server$ ./UDP_Server 10.10.1.2 5001 1  
Listening for packages at udp://10.10.1.2:5001  
Type q to quit the program!  
The transfer rate is 5.28e-15 Gbps, the package loss is 0%, the event rate is 0 kilo events per second, the event size is 0 bytes.  
The transfer rate is 4.97 Gbps, the package loss is 2.46%, the event rate is 301 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 5.09 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 5.08 Gbps, the package loss is 0%, the event rate is 308 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 3.84 Gbps, the package loss is 24.7%, the event rate is 232 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 4.93 Gbps, the package loss is 3.2%, the event rate is 298 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 4.77 Gbps, the package loss is 6.37%, the event rate is 288 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 4.83 Gbps, the package loss is 5.04%, the event rate is 293 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 4.15 Gbps, the package loss is 18.4%, the event rate is 251 kilo events per second, the event size is 2048 bytes.  
The transfer rate is 2.26 Gbps, the package loss is 55.4%, the event rate is 136 kilo events per second, the event size is 2048 bytes.  
^C
```

3 GBPS USING IFIC FIRMWARE

- Javier designed a firmware to simulate the preprocessing inside the SOM module. He sends the data to the left optical fiber and loop back to simulate ADC digiopt data.



3 GBPS IFIC FIRMWARE SIMULATION

STARE01 event packages reception without writing to disk. Data correctly transferred but end of events not correctly indicated making the server side data analysis fail.

```
userlec@store1:~/UDP_Server$ ./UDP_Server 10.10.1.2 5001 0
Listening for packages at udp://10.10.1.2:5001
Type q to quit the program!
```

[illegible]

3 GBPS IFIC FIRMWARE SIMULATION

STARE01 event packages reception and writing to disk. Transfer rate decays very slightly as the sever struggles to receive data and write it to disk.

```

01:~/UDP_Server$ ./UDP_Server 10.10.1.2 5001 1
Type q to quit the program!
The transfer rate is 5.28e-15 Gbps, the package loss is 99.4%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.39 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 3.17 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.75 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.82 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.84 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.78 Gbps, the package loss is 100%, the event rate is 0.000000
The transfer rate is 2.78 Gbps, the package loss is 100%, the event rate is 0.000000
^C

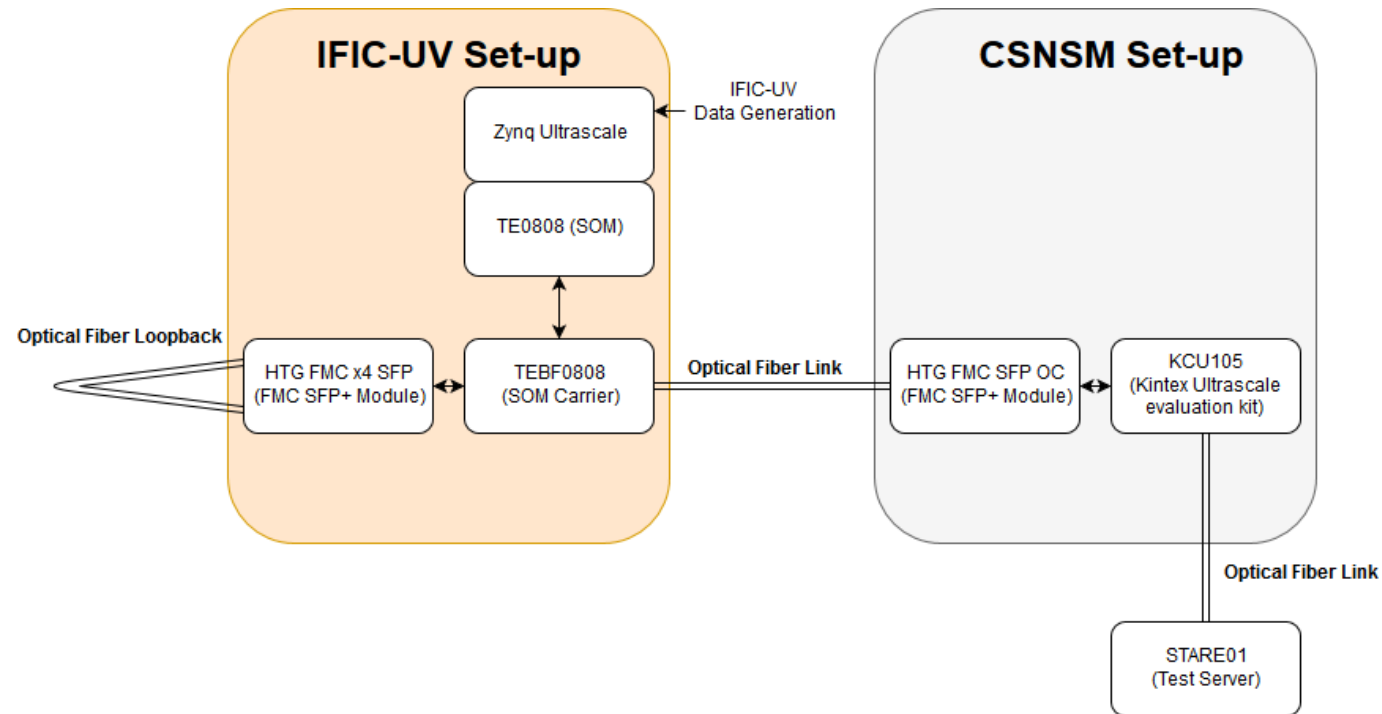
```

Reader

00000:	b91a00000000003e
00008:	6807545168075551
00016:	6807565168075751
00024:	6807565168075751
00032:	6807585168075951
00040:	6807585168075951
00048:	68075a5168075b51
00056:	68075a5168075b51
00064:	68075c5168075d51
00072:	68075c5168075d51
00080:	68075e5168075f51

10 GBPS USING IFIC FIRMWARE

- Javier designed a firmware to simulate the preprocessing inside the SOM module using full speed transfer data block was increased to maximum. He sends the data to the left optical fiber and loop back to simulate ADC digiopt data.



10 GBPS IFIC FIRMWARE SIMULATION

STARE01 STARE01 reception of a burst containing the same event to reach high transfer rates up to 10 Gbps .Transfer rate achieved without writing to disk.

```
userelec@stare01:~/UDP_Server$ ./UDP_Server 10.10.1.2 5001 0
Listening for packages at udp://10.10.1.2:5001
Type q to quit the program!

The transfer rate is 9.13 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.88 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.67 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.86 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 9.09 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.88 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.88 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.59 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 9.09 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.86 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 9.18 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 9.1 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
The transfer rate is 8.67 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event size is 0 bytes.
^C
```


10 GBPS IFIC FIRMWARE SIMULATION

STARE01 reception of a burst containing the same event. Transfer rate achieved while writing to disk varied from 5 to 7 Gbps

```
userelec@stare01:~/UDP_Server$ ./UDP_Server 10.10.1.2 5001 1
Listening for packages at udp://10.10.1.2:5001
Type q to quit the program!
The transfer rate is 5.28e-15 Gbps, the package loss is 99.3%, the event rate is 0 kilo events per second, the ev
The transfer rate is 6.41 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event s
The transfer rate is 6.9 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event si
The transfer rate is 6.83 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event s
The transfer rate is 6.73 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event s
The transfer rate is 5.84 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event s
The transfer rate is 5.09 Gbps, the package loss is 100%, the event rate is 0 kilo events per second, the event s
^C
```

10 GBPS IFIC FIRMWARE SIMULATION

STARE01 reception of a burst of events to reach high transfer rates. Transfer rate achieved without writing to disk. Six bursts are visible here. The software on STARE01 was not adapted for this test as it is made for continuous transfer assessment.

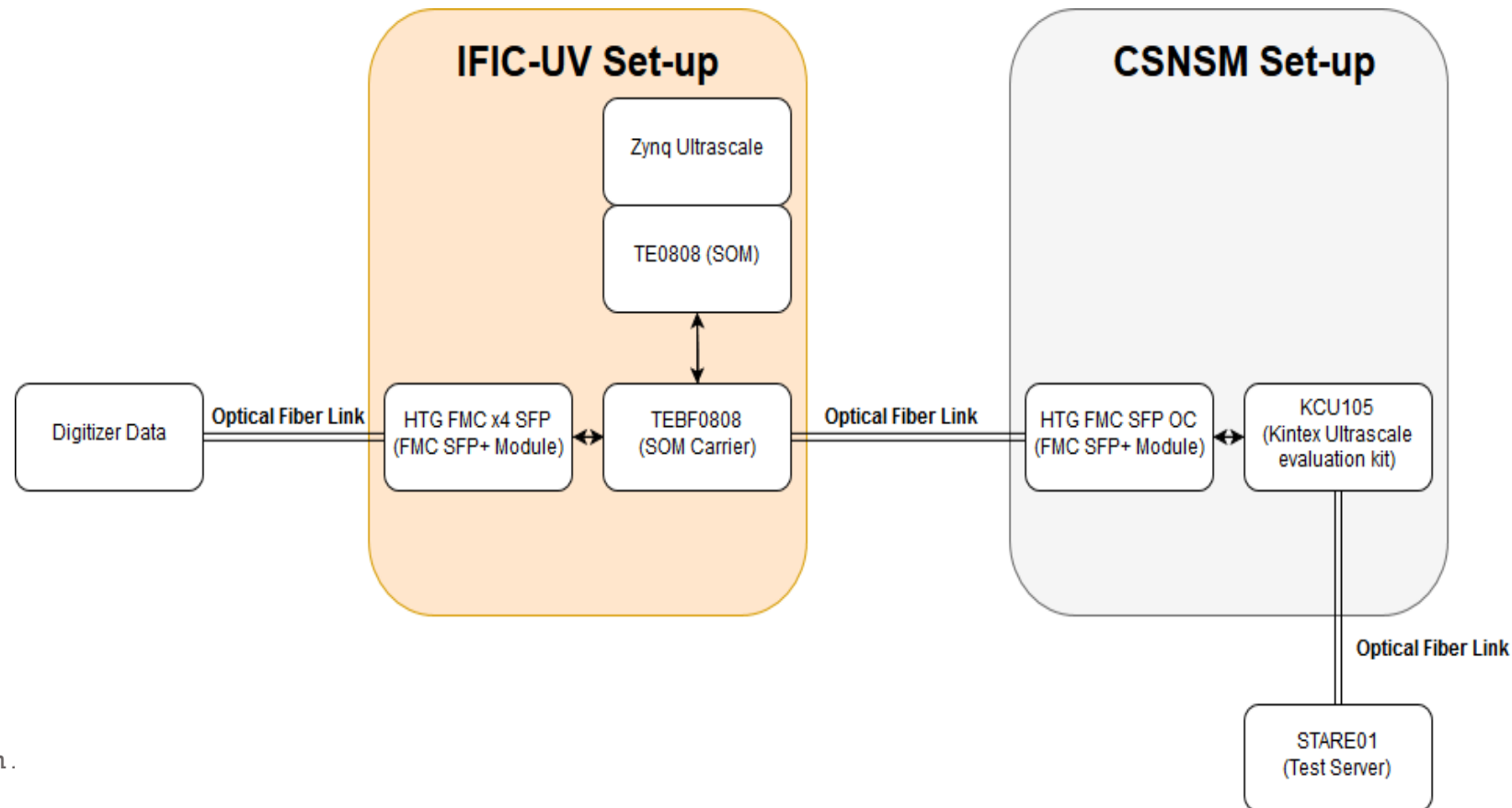
7	605	13e95035
8	606	16e95035
9	607	19e95035
0	608	1ce95035
1	609	1fe95036
2	610	03e95036
3	611	06e95036
4	612	09e95036
5	613	0ce95036
6	614	10e95036
7	615	13e95036

02840: 7769503577e95035
02848: 7869503578e95035
02856: 7969503579e95035
02864: 7a6950357ae95035
02872: 7c6950357ce95035
02880: 7d6950357de95035
02888: 7e6950357ee95035
02896: 7f6950357fe95036
02904: 0069503600e95036
02912: 0169503601e95036
02920: 0269503602e95036
02928: 0369503603e95036

```
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
rate is 3.3e-05 Gbps, the pack
rate is 7.43e-05 Gbps, the pac
rate is 0.000116 Gbps, the pac
rate is 0.000116 Gbps, the pac
rate is 0.000149 Gbps, the pac
rate is 7.43e-05 Gbps, the pac
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
rate is 0 Gbps, the package lo
```

FULL BENCH WITH DIGIOPT DATA (FAILED)

- Javier designed a firmware to send the adc raw data inside the SOM module using DIGIOPT module . Lot of software problems and synchronisation clock manager problems before data reaches STARE. Problem is solved now



CONCLUSION AND NEXT STEPS

- POC Works ! Now is time for prototyping modules and real work.
- Excellent collaboration work.
- But but but
- There is a lot of work left :
- Software facilities for electronic qualification to analyse data @ 10 Gbps (slow control, histograms, network speed checkup and data losses, setup of more complex network structure etc..).
- Improvement of pre-processing bench setup. There are enormous parameters to take into consideration.
- The STARE slow control and data saving on disk is still preliminary.
- Development of automated test procedures for testing connections (pre-processing to STARE and STARE to server)
- Local facilities on the STARE using IPBus makes life easy to be independent of the 10 Gbps.
- All these packages are needed for production and maintenance by the manufacturing company.
- Buy and Install STARE and server facility in IFIC Valencia ASAP to have independent bench for the IFIC firmware and hardware developments

THANK YOU