

# **Status report regarding SpaceFibre implementation activities**

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# 1. Our GOAL in SpaceFibre activities

Standard interface specification is required for high speed data transmission using optical fibre and devices.

- HITEN saw the reverse side of the moon using optical fibre transmission system (1993).
- OICETS succeeded in laser communication with ESA satellite (2005).

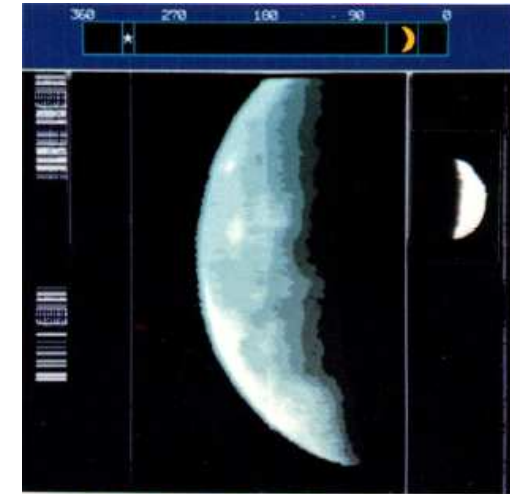
Standard interface is also required for SERDES I/F and galvanic isolation.



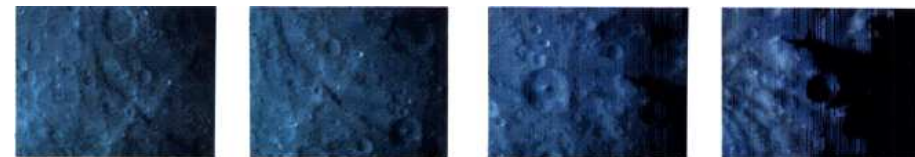
OICETS (2005)



HITEN (1993)



ONSの捉えた月（中央）と地球（右）



月面落下直前、クレーターが次第に大きく迫り、やがて日陰部に入る (1993年4月11日)

## 2. Objectives of NEC's implementation activities

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**Confirmation of protocol validation (not verification) with NEC's application premise through the connectivity test in UoD planned in this Nov. (or Dec).**

**Evaluation of the spec. of SpaceFibre, especially on QoS.**

- Error resilience
- Throughput
- Latency
- others

**Providing the feedback of our experience to the SpaceWire WG**

# 3. Prototyping Environment

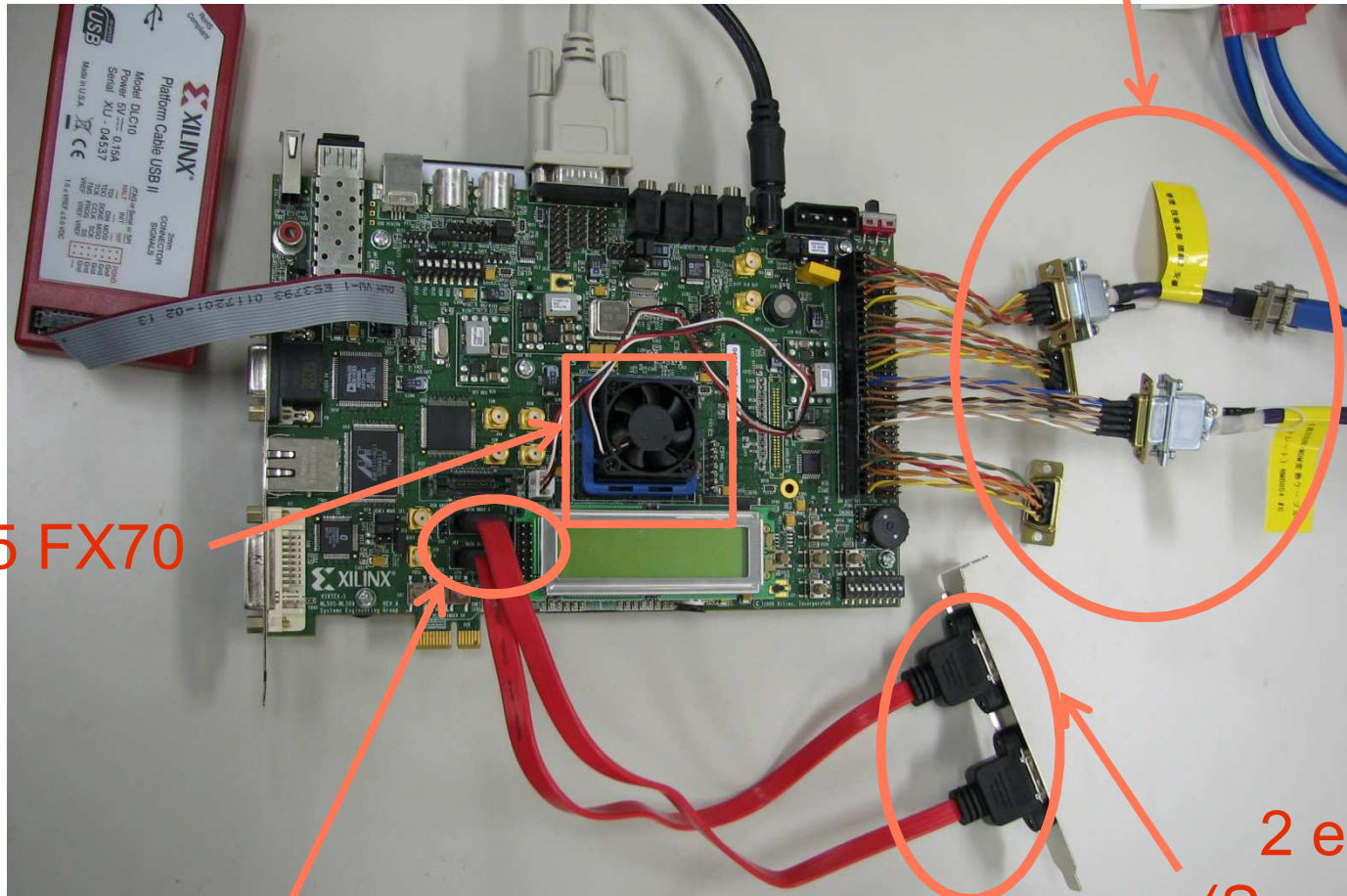
Xilinx, ML507 (Virtex-5 FX70)

4 SpW Connectors

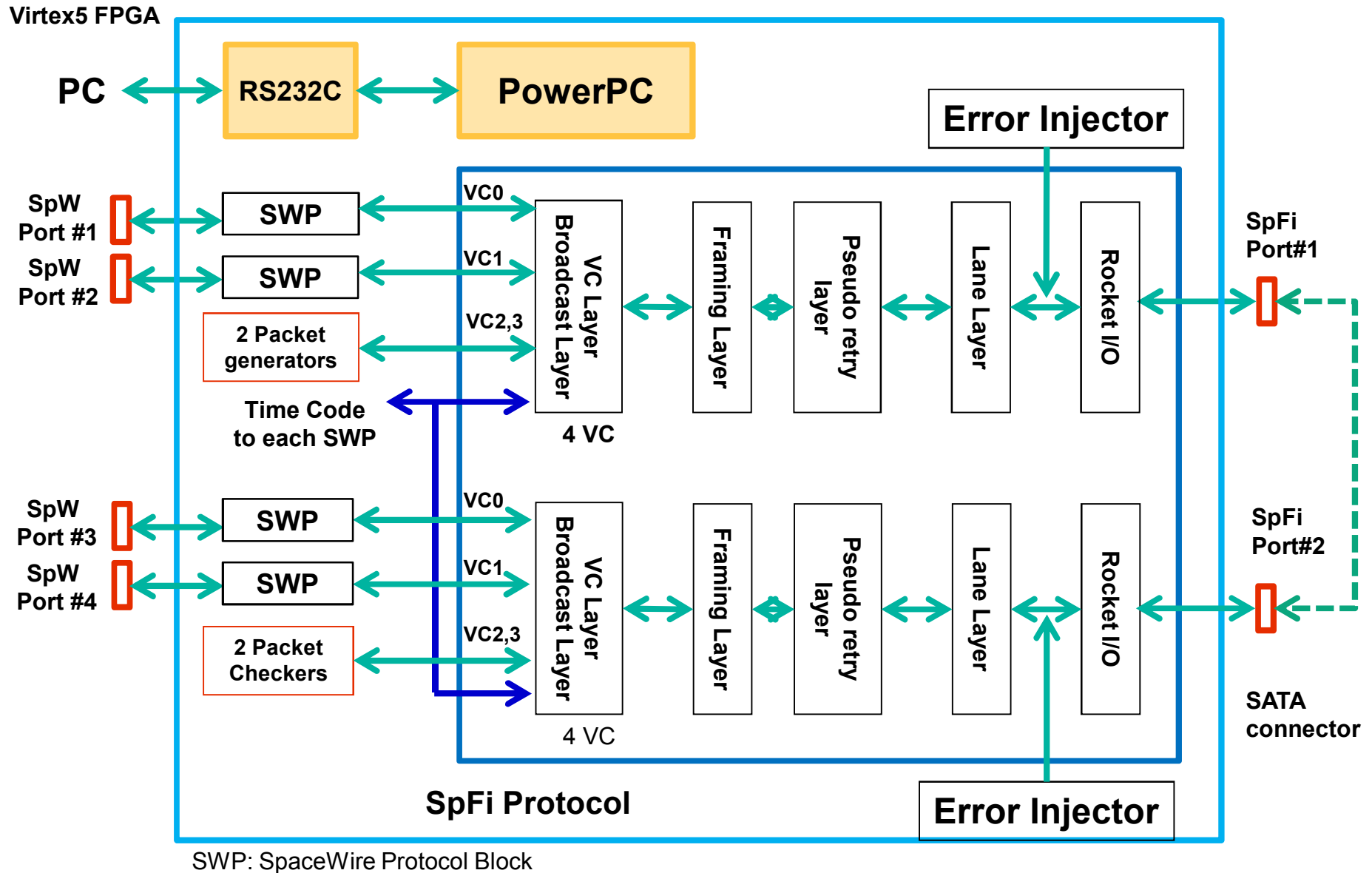
Virtex5 FX70

2 SATA

2 eSATA  
(SpaceFibre)



# 3-1. Architecture



## 3-2. Architecture

### FPGA-base implementation

- Rocket I/O (GTX) is used as PHY (GTX supports 6.5Gb/s)

### Fully support the specification-D, except for lane control & retry layer

- One lane (2.5Gbps)
- Pseudo retry layer

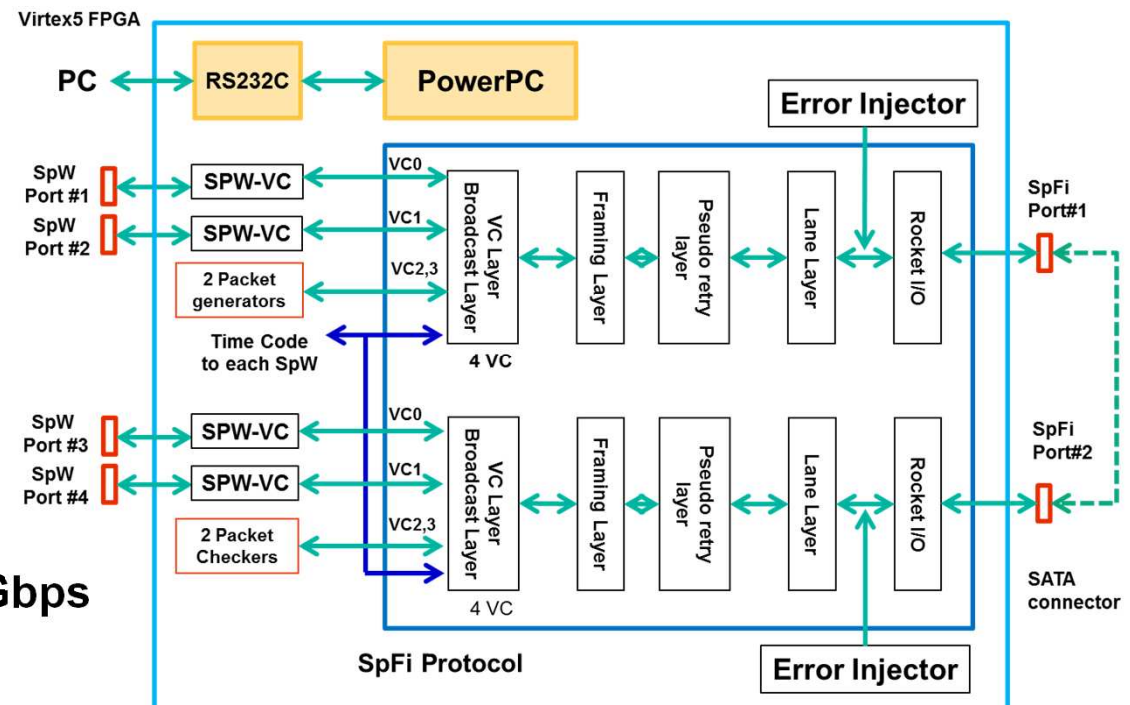
- Add/Extract SEQ#
- Add/Check CRC
- No retry buffer
- No ACK/NACK

### 4 Virtual channels

- 2 SpW ports
- 2 PRBS generator/checker
  - each generator supports 2.5Gbps

### 1 Broadcast channel

### 1 Pseudo error injector



## 3-3. Current Status

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### FPGA Implementation

- RTL code based on SpFi standard Draft D was completed.
- Verification by using real test devices is working now.
- Modification following the revised standard will be done by the interoperability test at UoD in this Nov. or Dec.

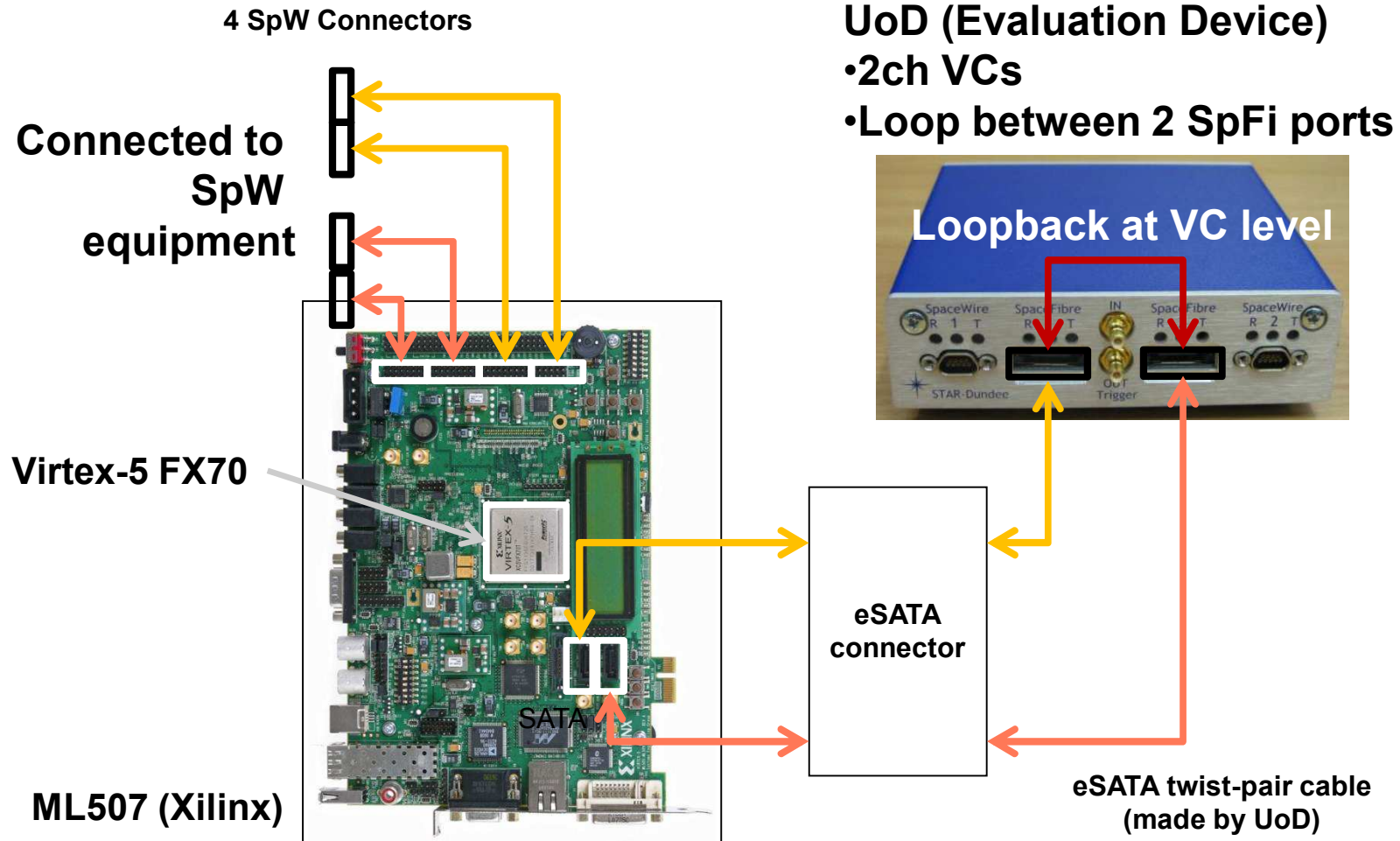
### QoS Evaluation

- RTL simulation base
- Simulation for many cases is going on
  - Expected Bandwidth, Priority, Scheduled, Best Effort, and mix them.
  - Error Injection



# 4. Connectivity test

**Test Plan: NEC prototype device equipped with two SpW ports is connected to UoD test set through SpaceFibre links.**



# 5. Summary

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## ■ NEC SpaceFibre Prototyping activity status

- Test Device/Architecture is under development.
- Current Status
  - Test Device : Working with Xilinx FPGA through Rocket I/O.
  - QoS Evaluation : Mainly by simulation. Implementation will be completed by the midst of October.

## ■ Connectivity test with UoD is planned in this Nov/Dec.

- Two SpW devices will be communicated through SpFi in order to check the architecture for virtual channel realization.
  - Physical interface compatibility check for SpFi;
    - UoD test set and NEC prototype model
- Exploiting the loopback mode of UoD test set

Empowered by Innovation

**NEC**