



MODELLING OF THE SPACEWIRE COMMUNICATION PROTOCOL

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INTRODUCTION

Modelling takes more important role in the development process as a solution to perform detailed check of the specification and project verification to a stage of physical realization.

SpaceWire is a perspective and fast-developing communication standard supported and implemented by:

- European Space Agency
- NASA (USA)
- JAXA (Japan)

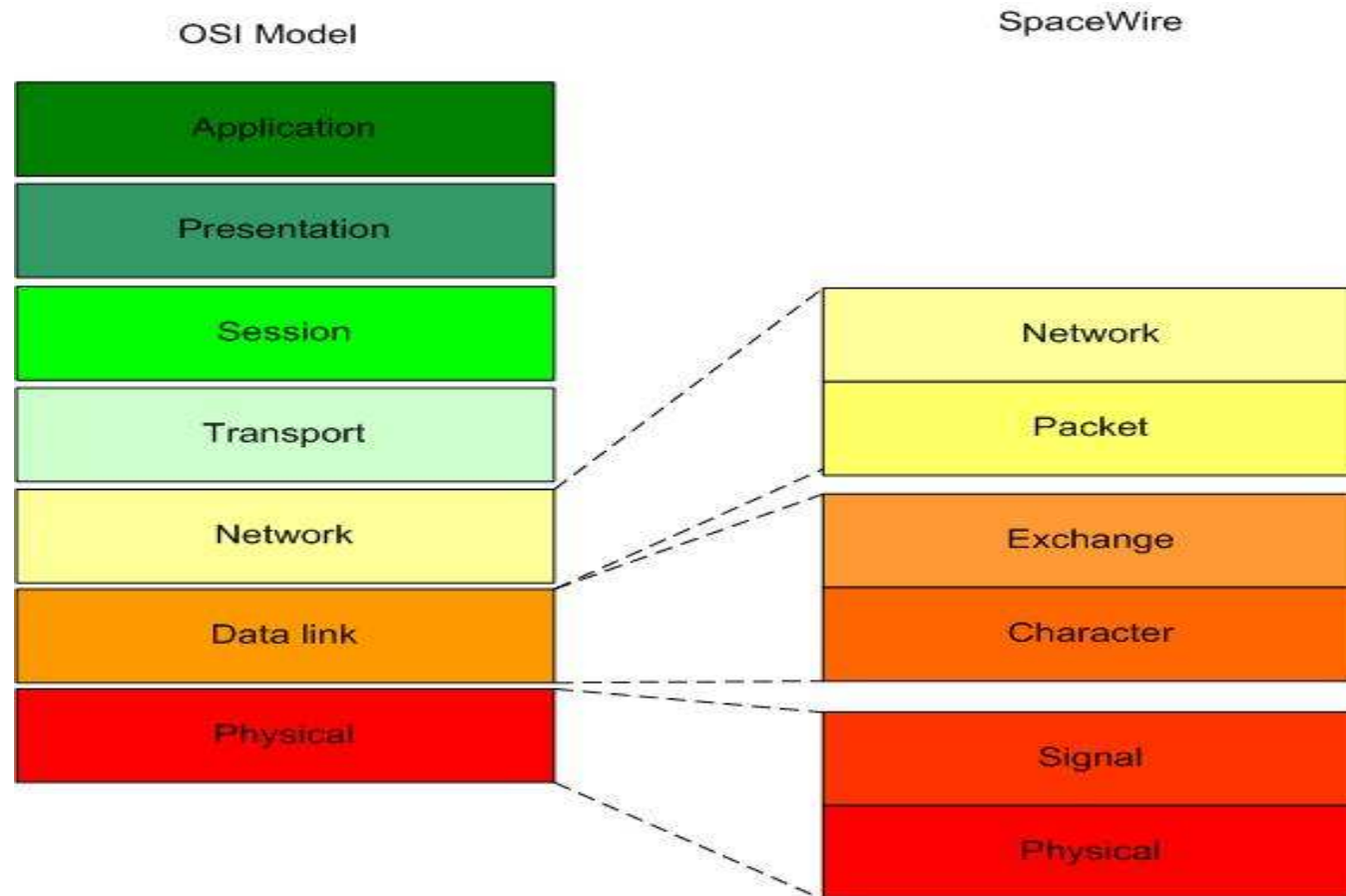
There are a number of transport layer protocols which are applied for use in tandem with SpaceWire.

We implemented a layered model of a SpaceWire, RMAP and STP protocols for testing of the specifications and standards. We show you an overview of our activity and share the results.



SPACEWIRE

SpaceWire is a communication network based on an IEEE 1355 communication standard, that provides high-speed links and networks for use onboard spacecraft.



STP REVIEW

STP = Streaming Transport Protocol

Key features:

- multiple data transfer
- initialize connection
(connection oriented protocol)
- data flow control
- data validation (correctness and right order of arriving packets) ●

RMAP OVERVIEW

RMAP = Remote Memory

Access Protocol

Features:

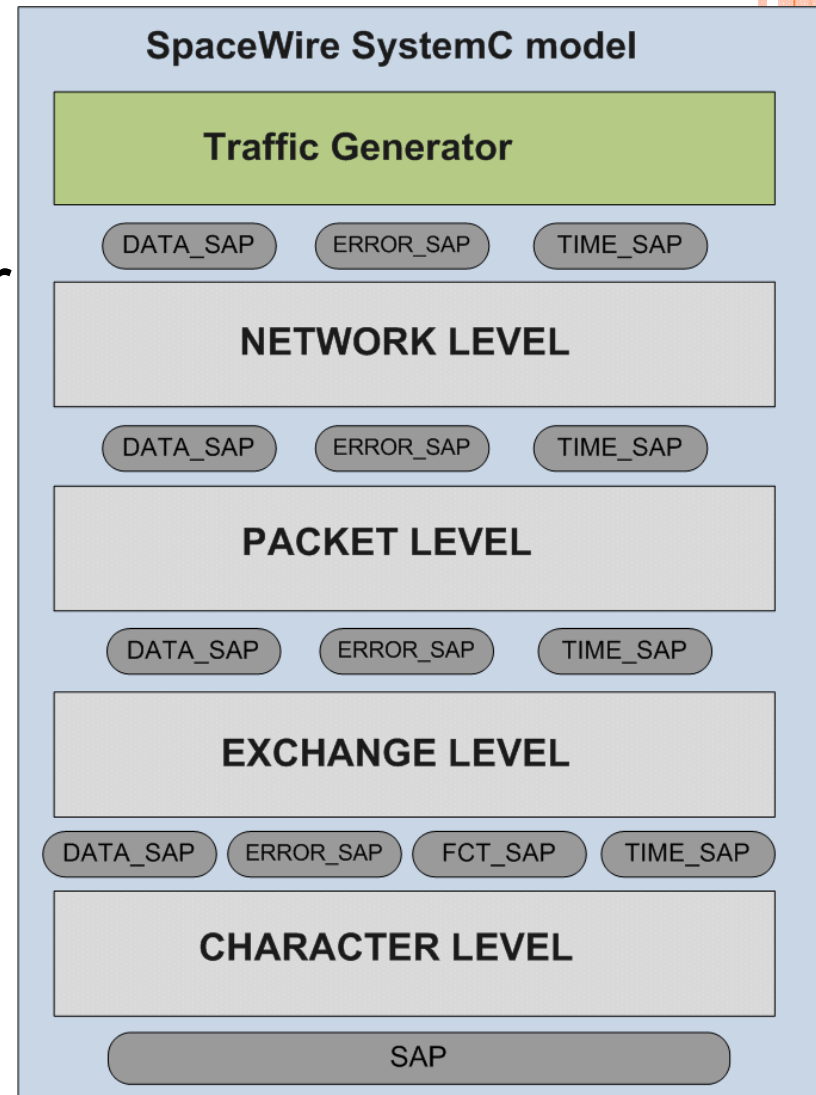
- to support a wide range of SpaceWire applications;
- to configure a SpaceWire network;
- to control SpaceWire units;
- to gather data and status information from those units;
- may operate alongside other communications protocols running over SpaceWire;
- works with units without an embedded processor;
- works with units with an embedded processor.



SPACEWIRE MODEL

Features :

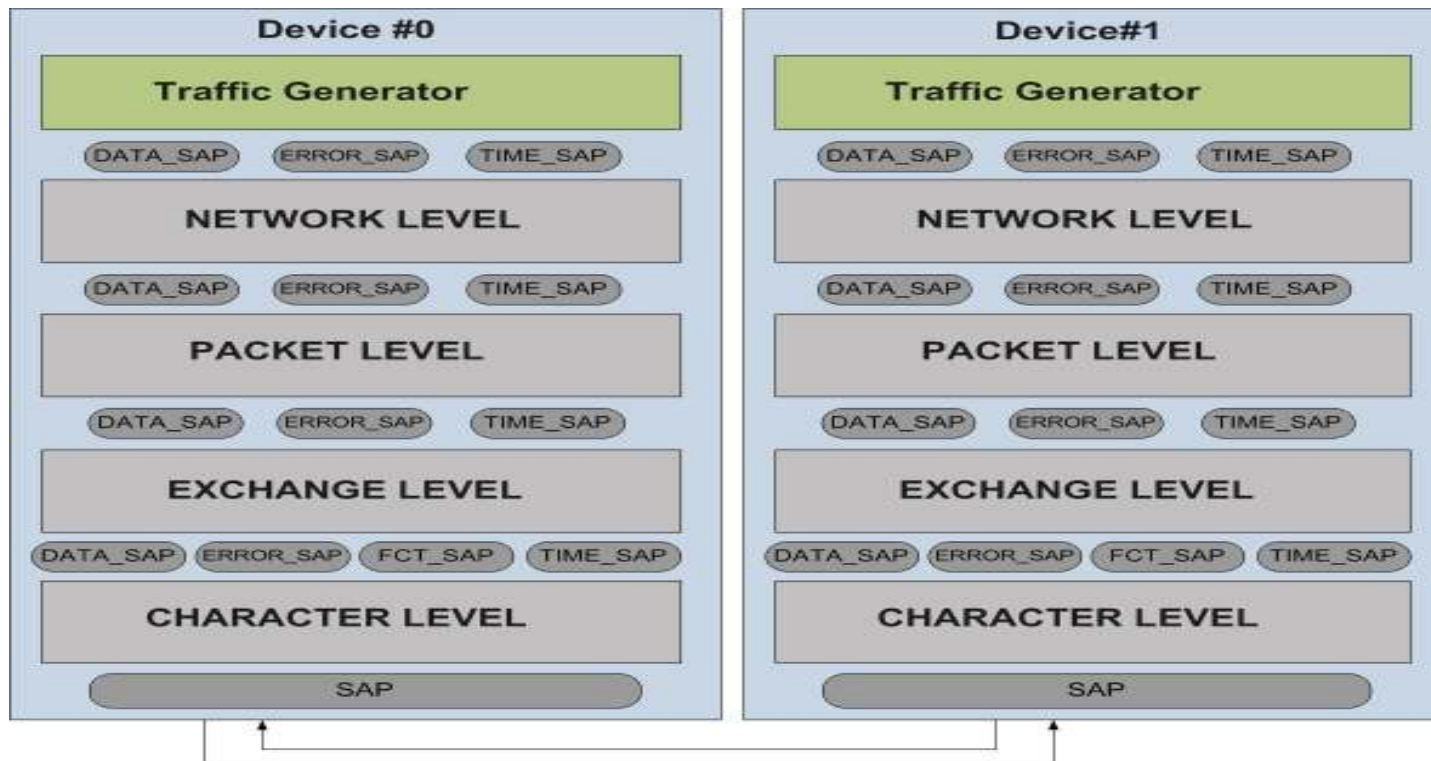
- the modelling per layer method is used;
- the functionality of each layer is distributed between internal blocks;
- implemented in respect to specification and includes all required functionality;
- developed Serves Access Points (SAPs)
- the Traffic Generator



(1/3)

Point-to-point connection of two models imply

- Link start, link connection establishment
- Data flow initialization
- And interaction of both devices



(2/3)

Main benefits of this method:

- The model could test all the internal mechanisms
- There are possibility to trace the whole data exchange process in both directions
- The traffic analysis is done by the model itself according to specification
- There is a possibility to test not only the protocol itself, but to see how the other protocols could operate with it, work on top or in the bottom of the protocol



(3/3)

Testing:

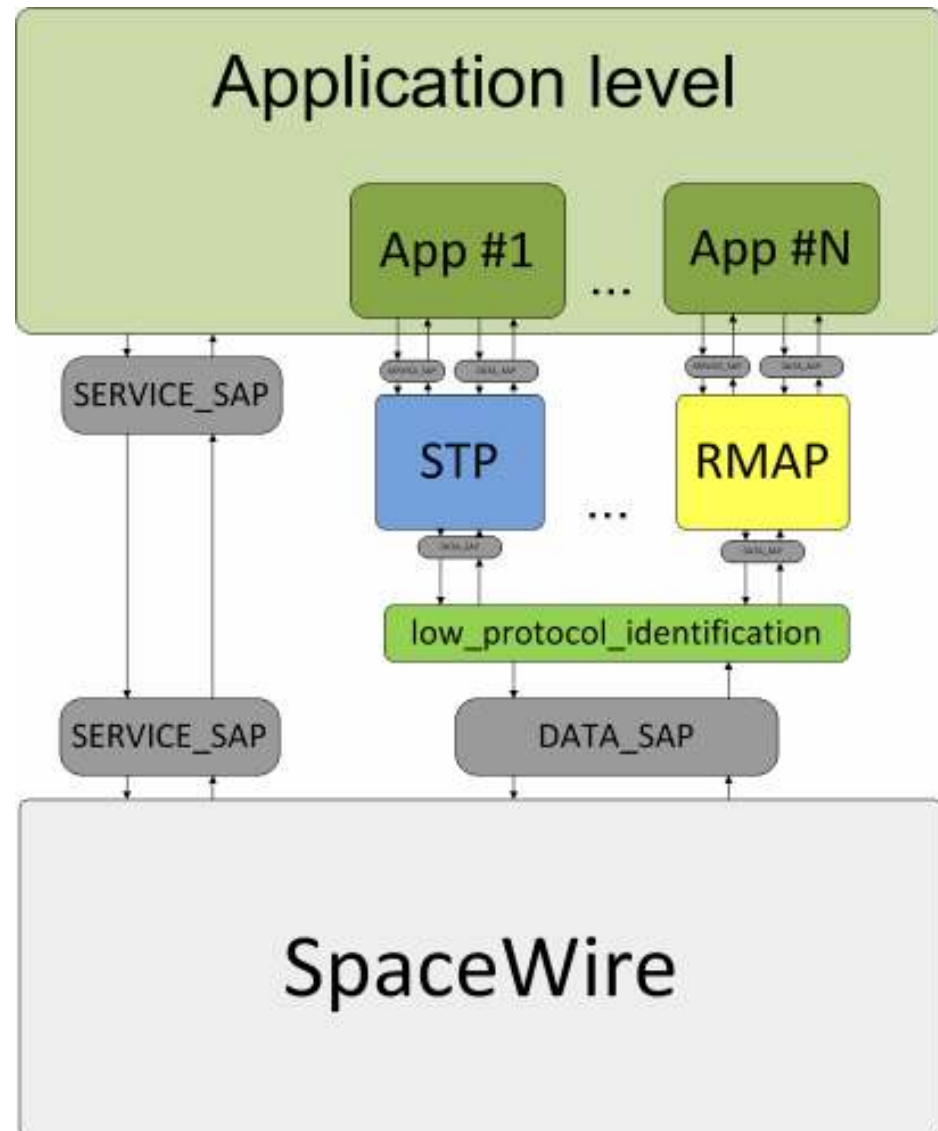
- Traffic generator
- Data corruption
- Very close to the real devices communication
- Creating various situations
- Model upgrading

Result:

- Model is inlined with the specification
- All bugs and inconsistencies are fixed
- Model could be used for the other researches, e.g. transport protocols testing

STP AND RMAP OVER SPACEWIRE

- Preliminary modeling of the protocol protects a developer from the specification defects and consequently from the errors which could occur during the ready devices execution



CONCLUSION

Modeling results:

- found a number of specification errors and wrongly described places in the specification
- prepared a set of additions and clarifications to the specification
- assists development of STP protocol



THANK YOU

