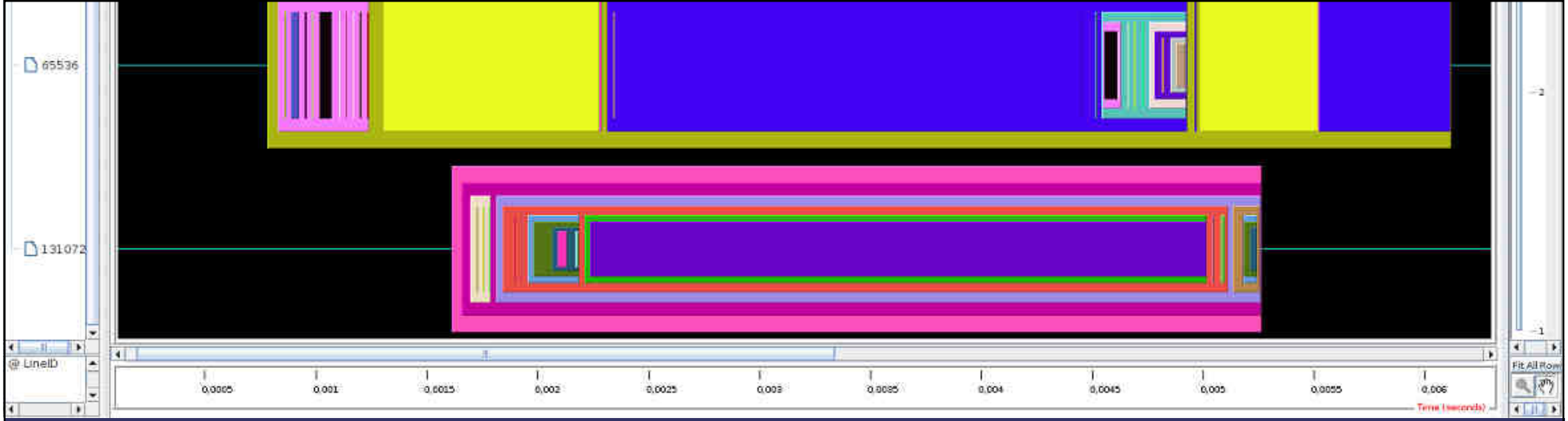


Application of the trace driven process on a Software Radio case-study, experiments and preliminary results

Shuai.Li@fr.thalesgroup.com
Thales Communications & Security

THALES

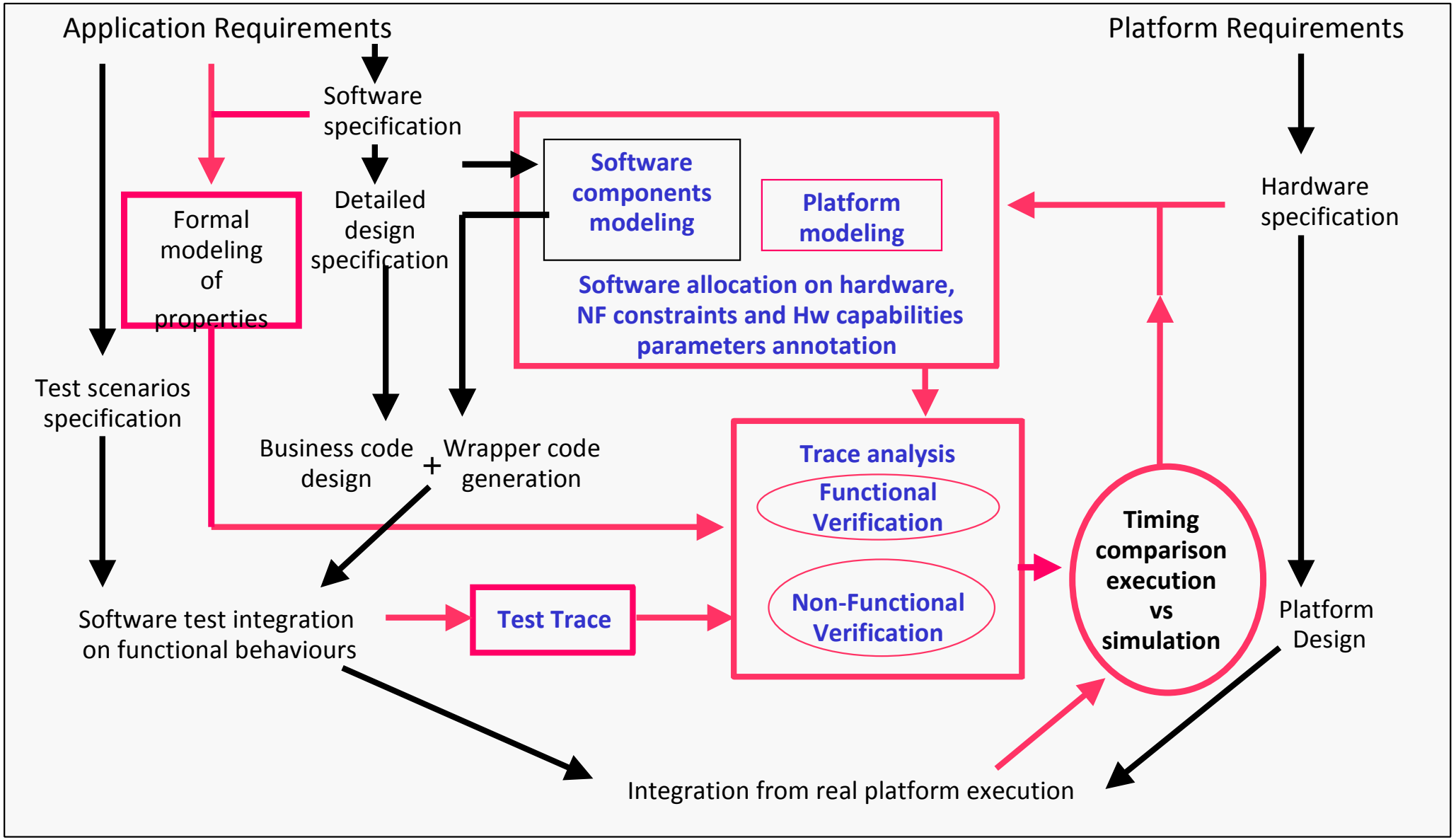
Agenda

1. *Context and objectives*
2. *Case-study application*
3. *Application MARTE model*
4. *Trace generation and analysis*
5. *Future works*

THALES

Part of the PRESTO flow

1. Context and objectives



THALES

Goals of first trace exploitation experiments

Functional and timing verification

- Verify arriving order of events and their inter-dependencies
- Verify duration constraints between events

Models and execution traces

- Filter execution traces
- Compare with specifications automatically

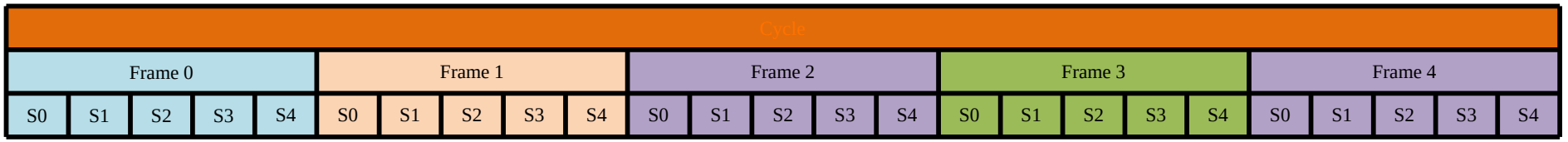
Integration and ease-of-use

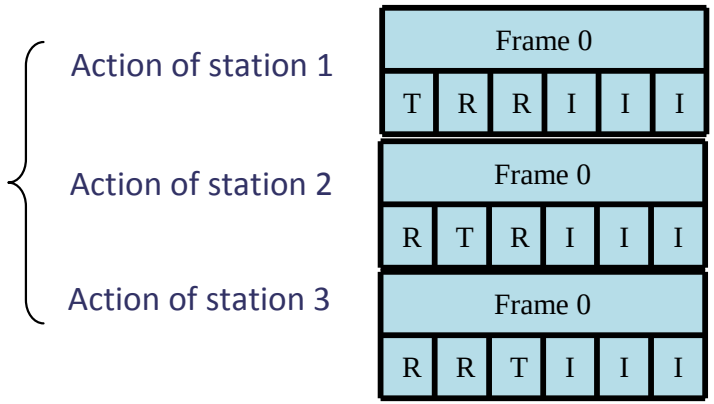
- Integrate into current design flow without modifying (too much) system engineer's habits
- Automate the process through tools development

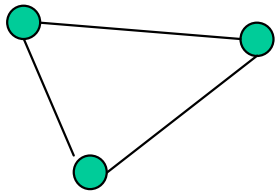
TDMA-based ad-hoc radio protocol

2. Case-study application

Time-Division Multiple Access





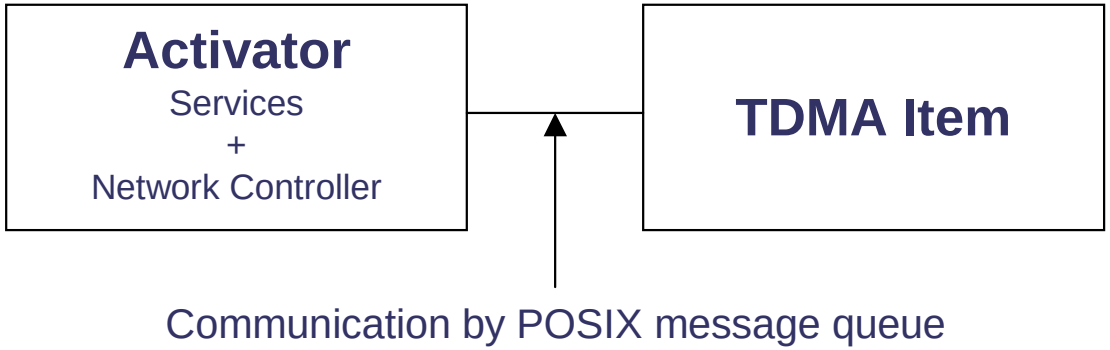


T: Transmission, R: Reception, I: Idle

Internal representation

THALES

Software tests implementation



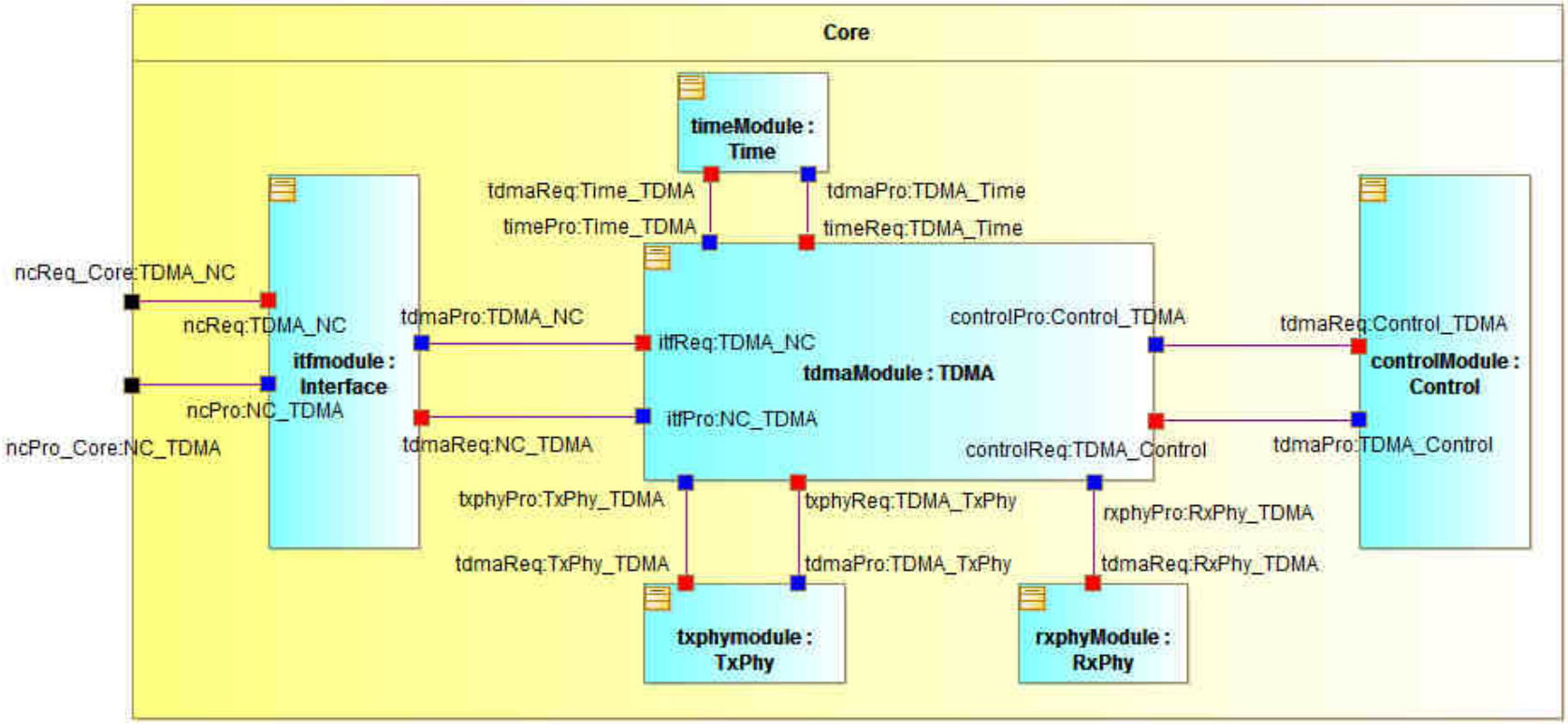
Execution environment

PandaBoard (OMAP4430)
+
Linux 2.6.38.2

THALES

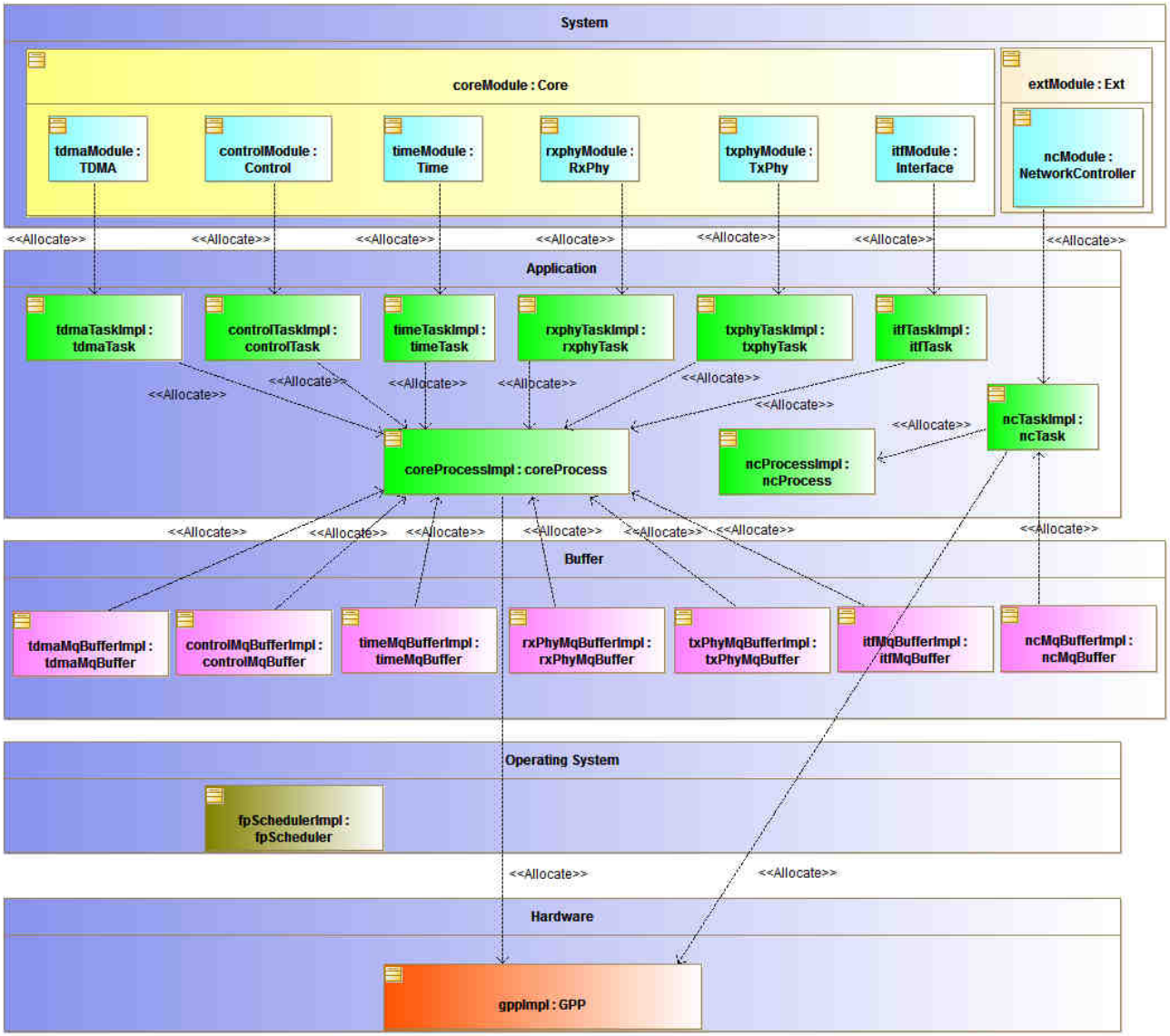
Component-based model

3. Application MARTE model



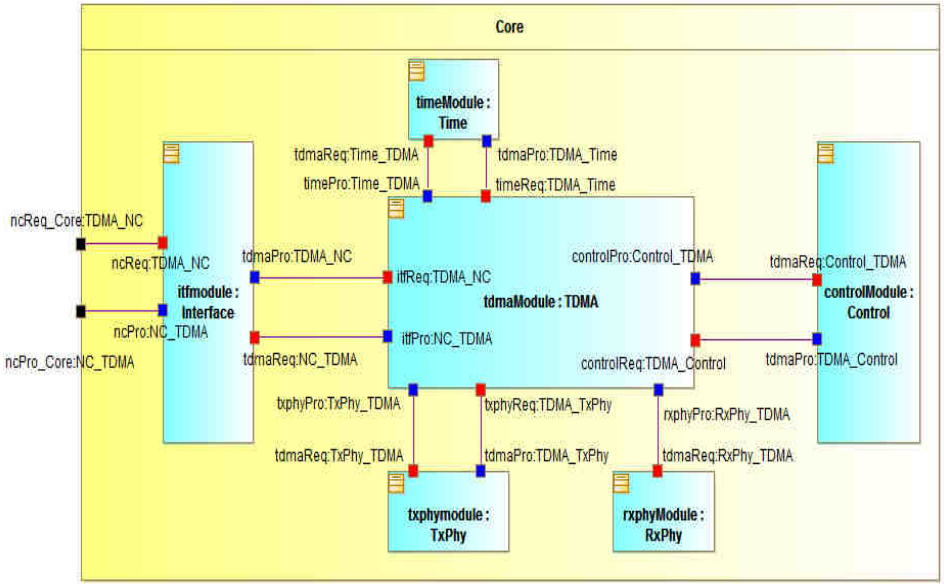
THALES

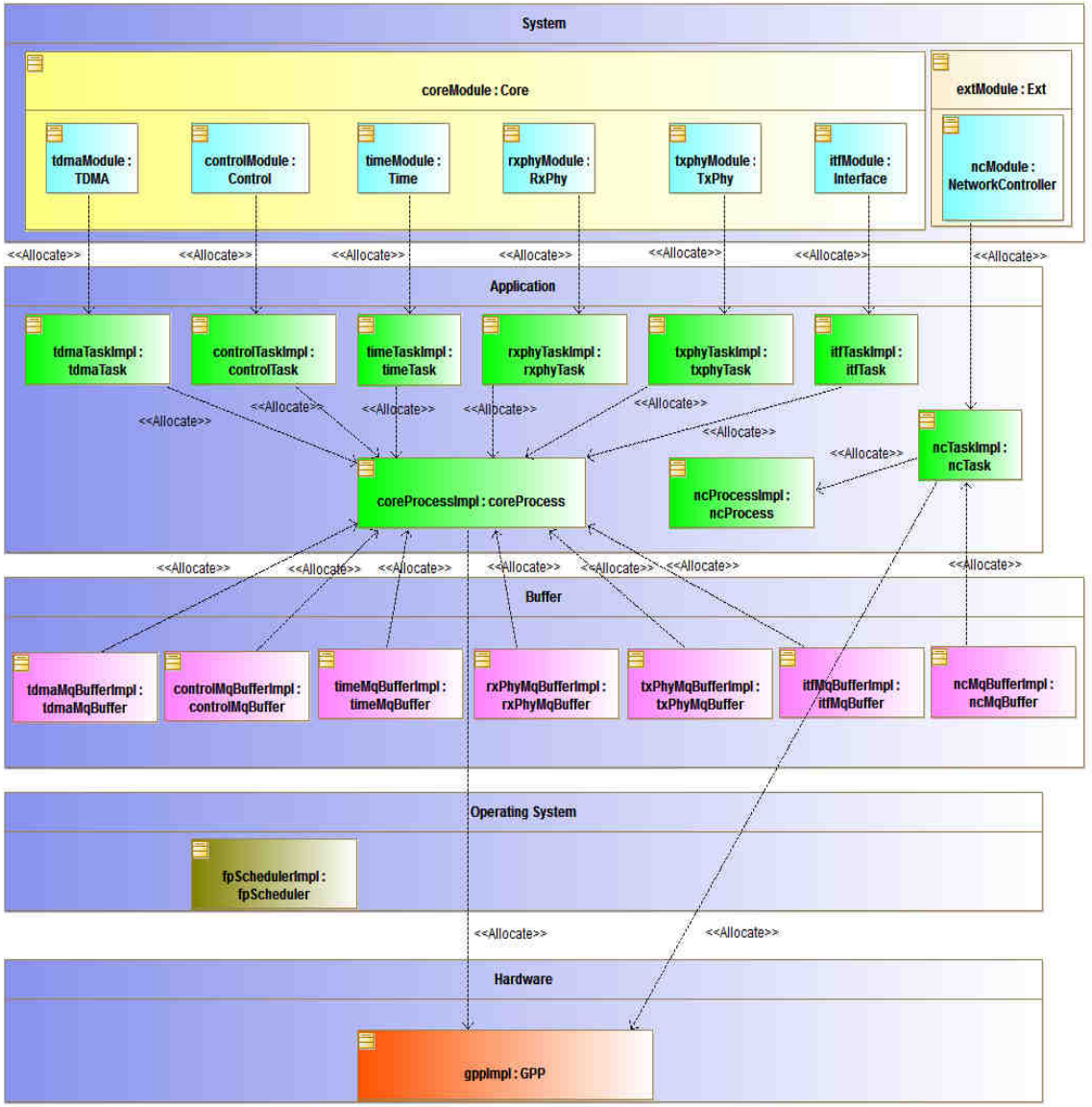
3. Application MARTE model



MARTE stereotypes

3. Application MARTE model

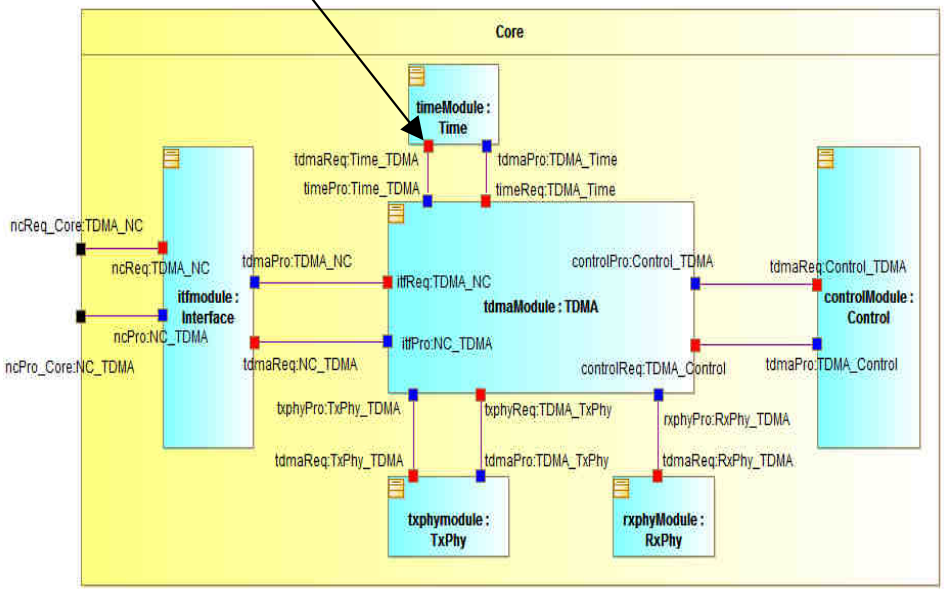


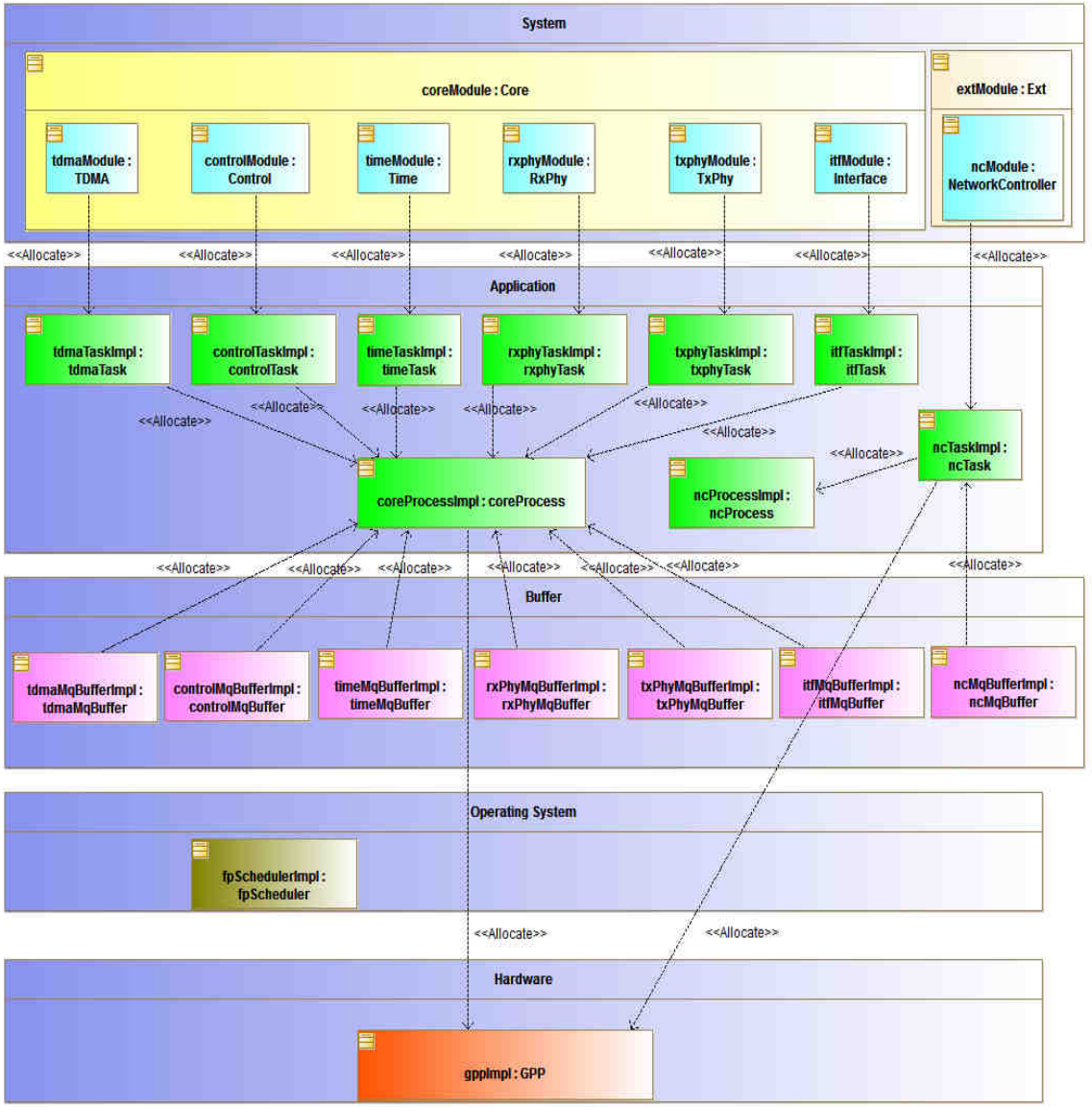


THALES

MARTE stereotypes

3. Application MARTE model

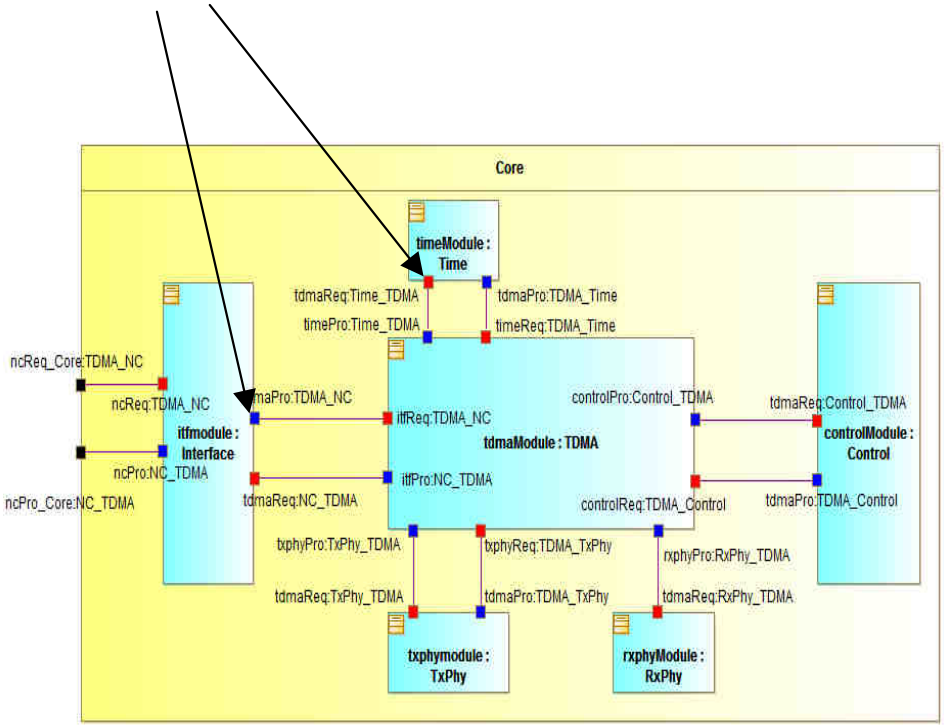


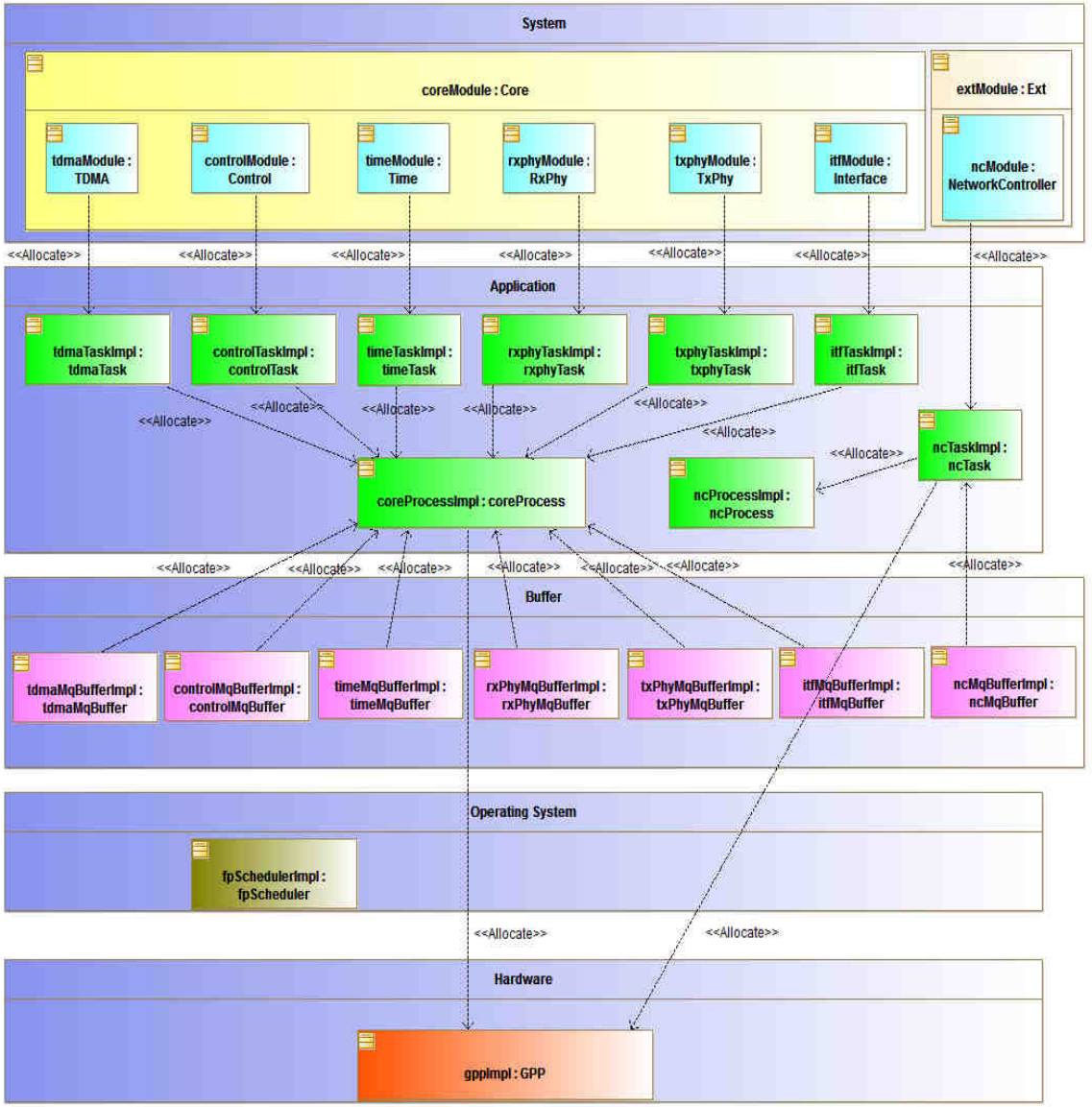


THALES

MARTE stereotypes

3. Application MARTE model



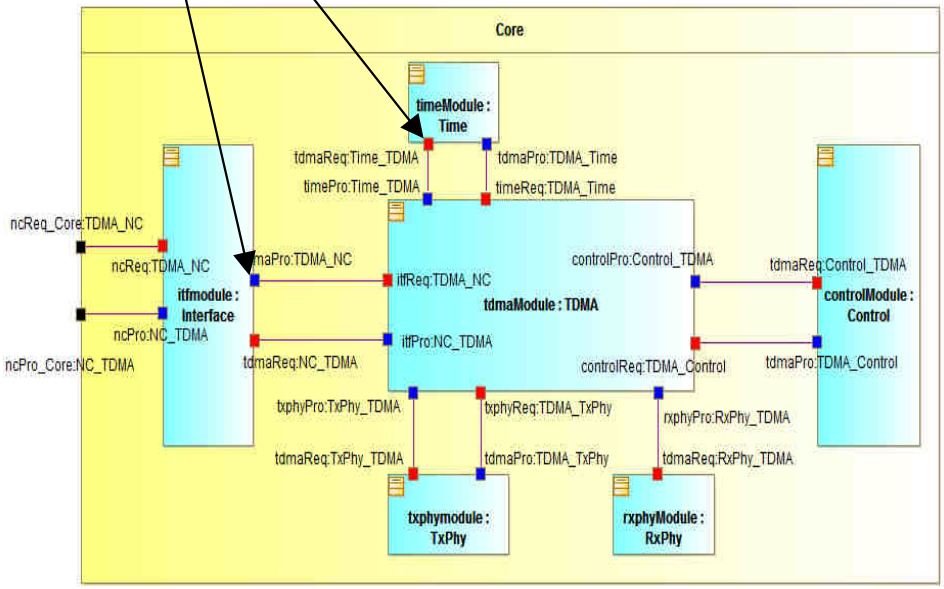


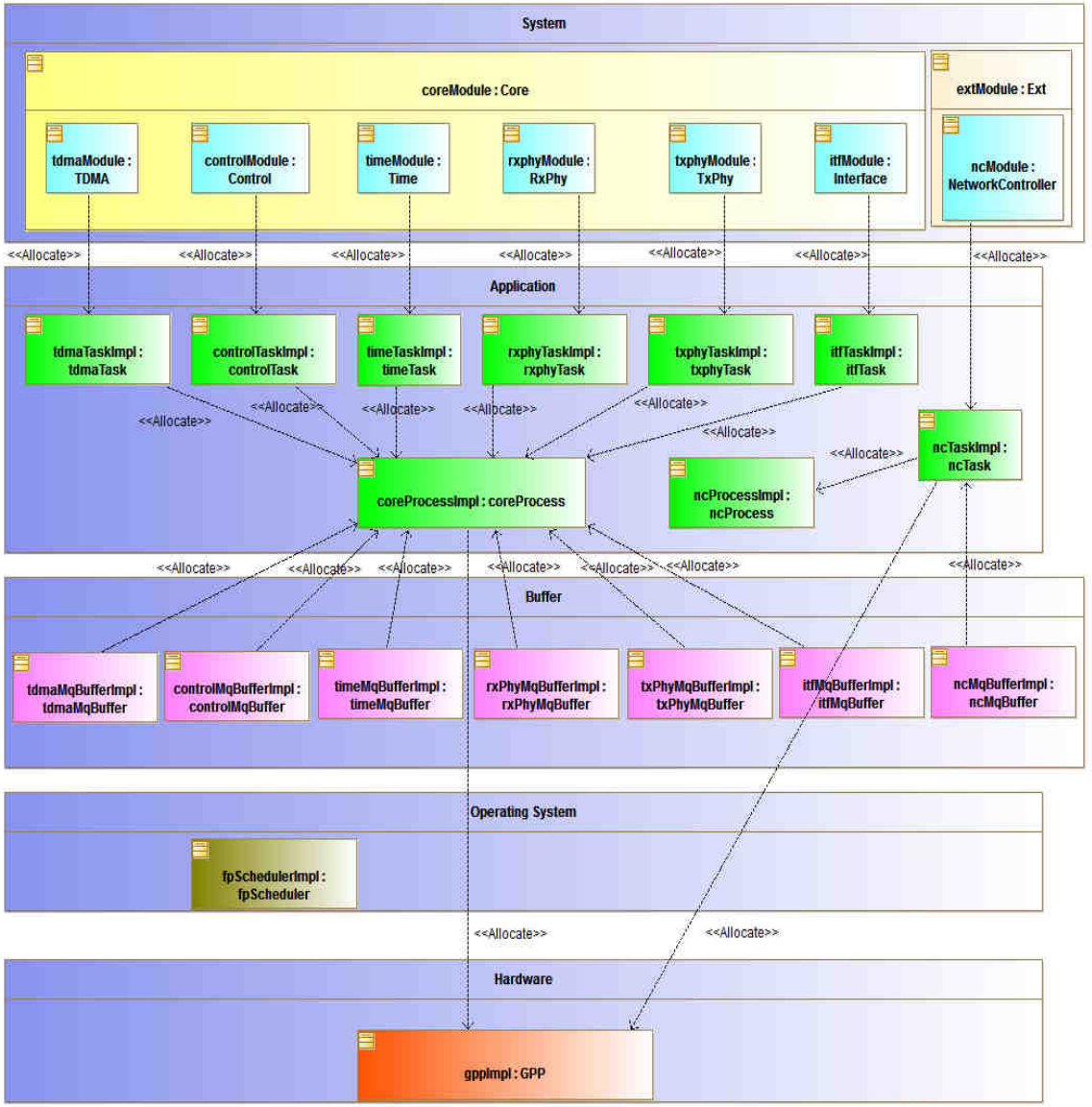
THALES

MARTE stereotypes

3. Application MARTE model

<<ClientServerPort>>

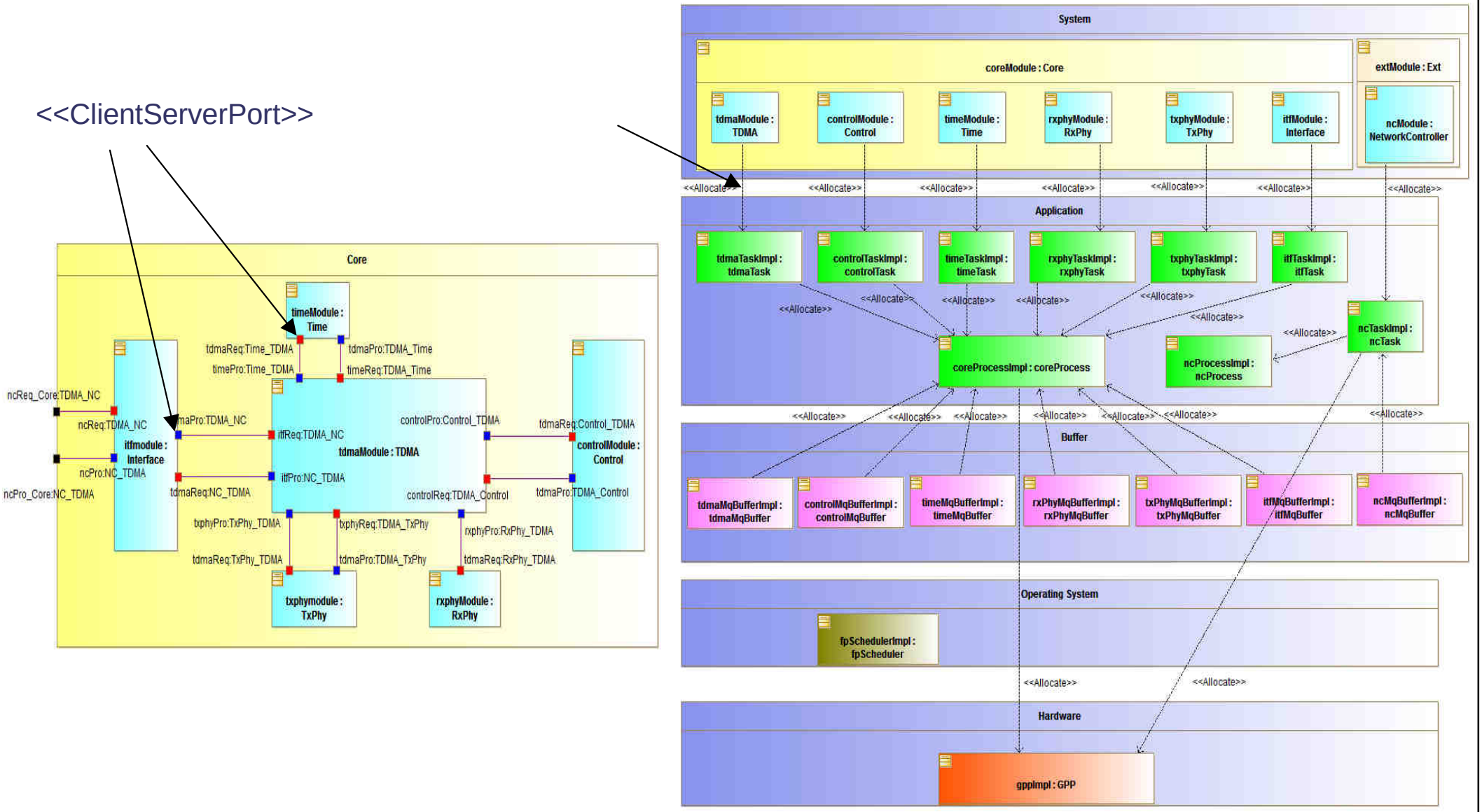




THALES

3. Application MARTE model

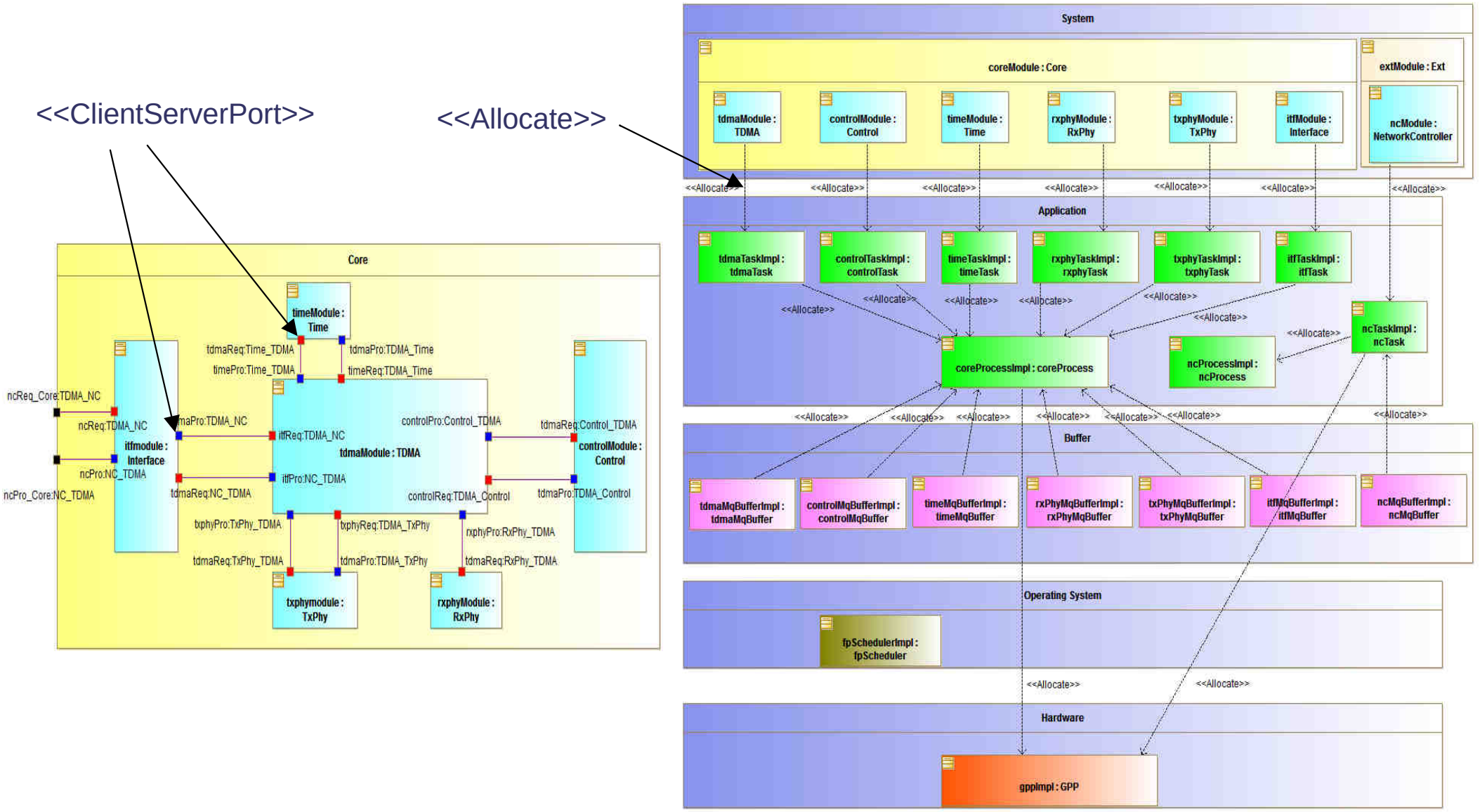
<<ClientServerPort>>



THALES

MARTE stereotypes

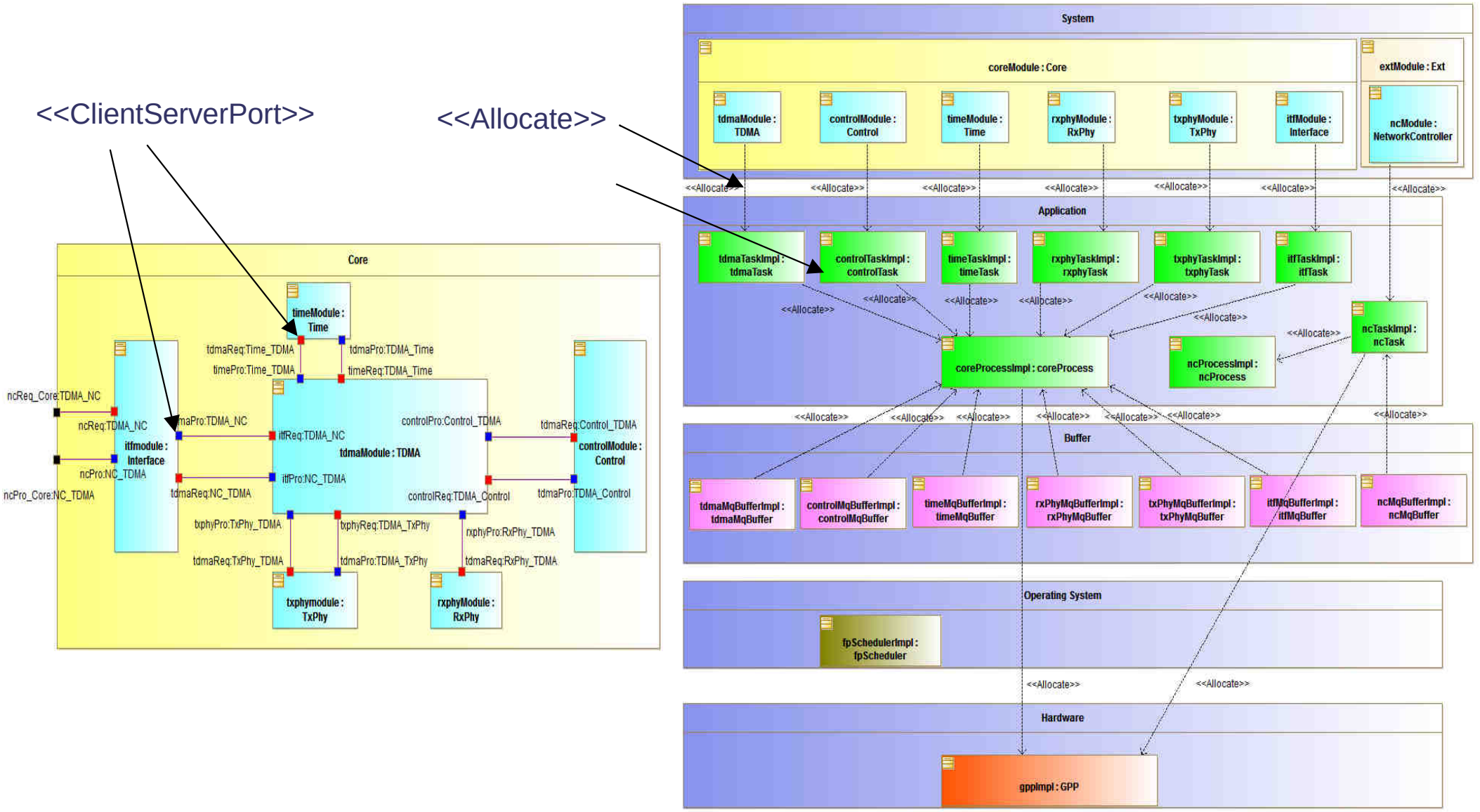
3. Application MARTE model



THALES

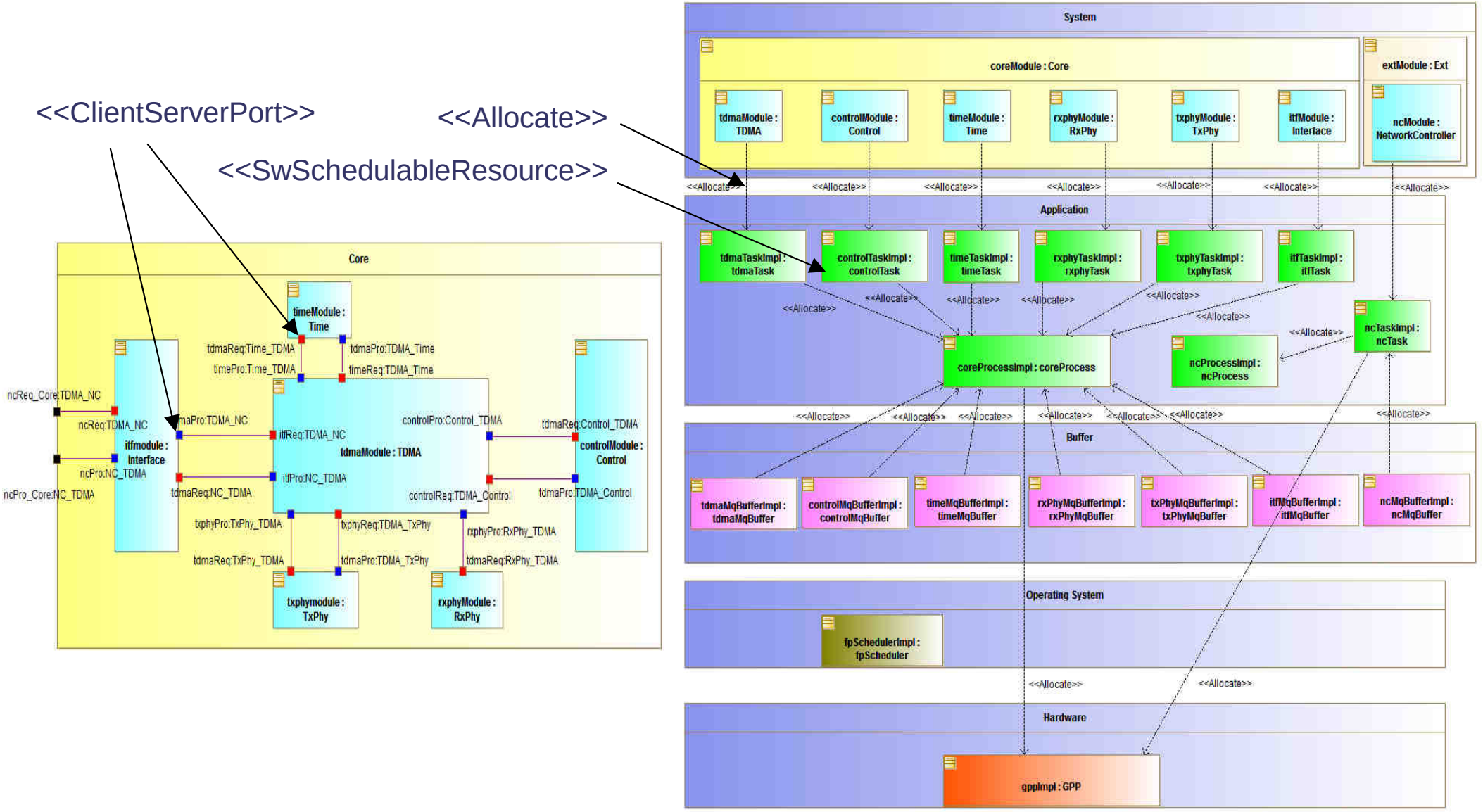
MARTE stereotypes

3. Application MARTE model

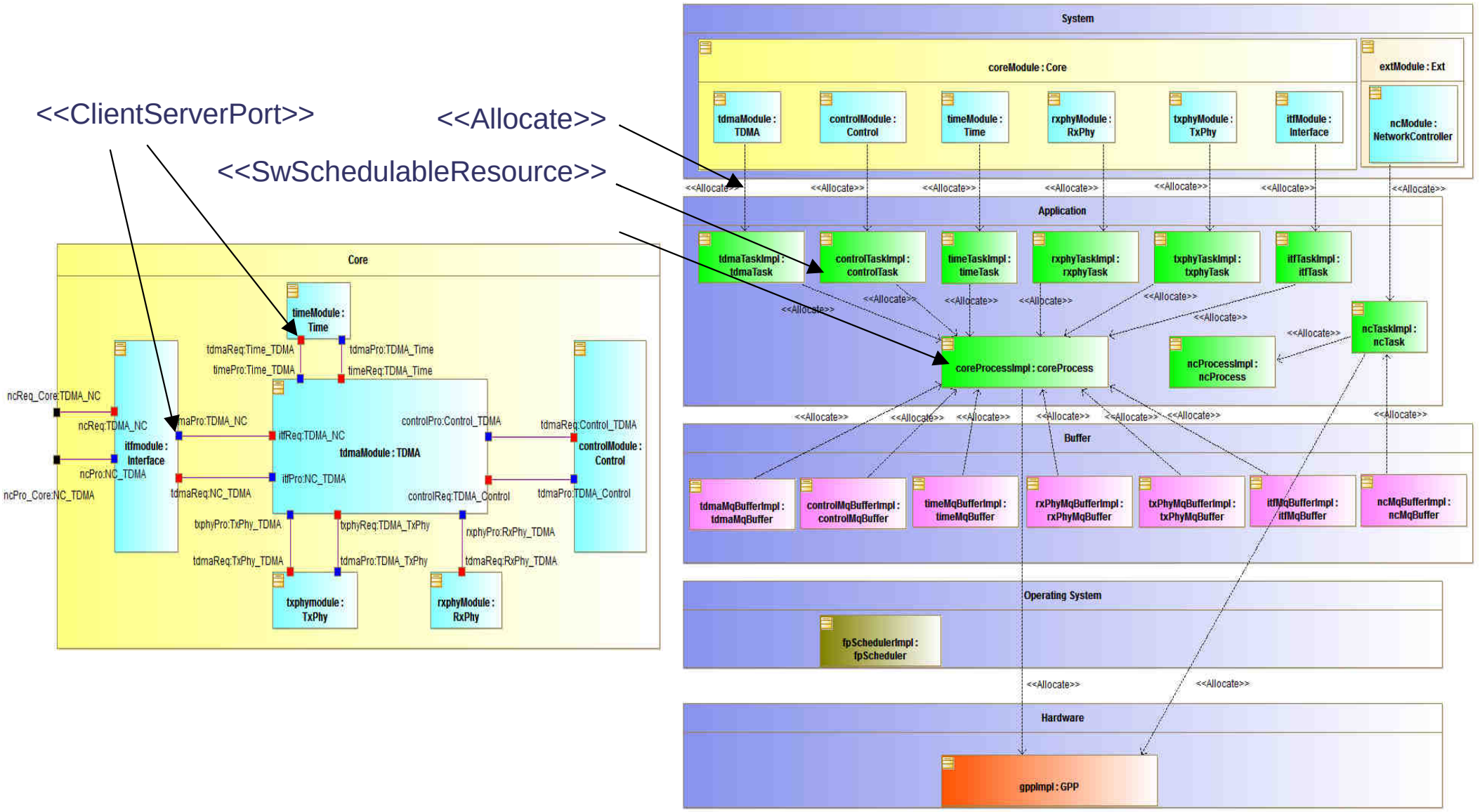


THALES

3. Application MARTE model

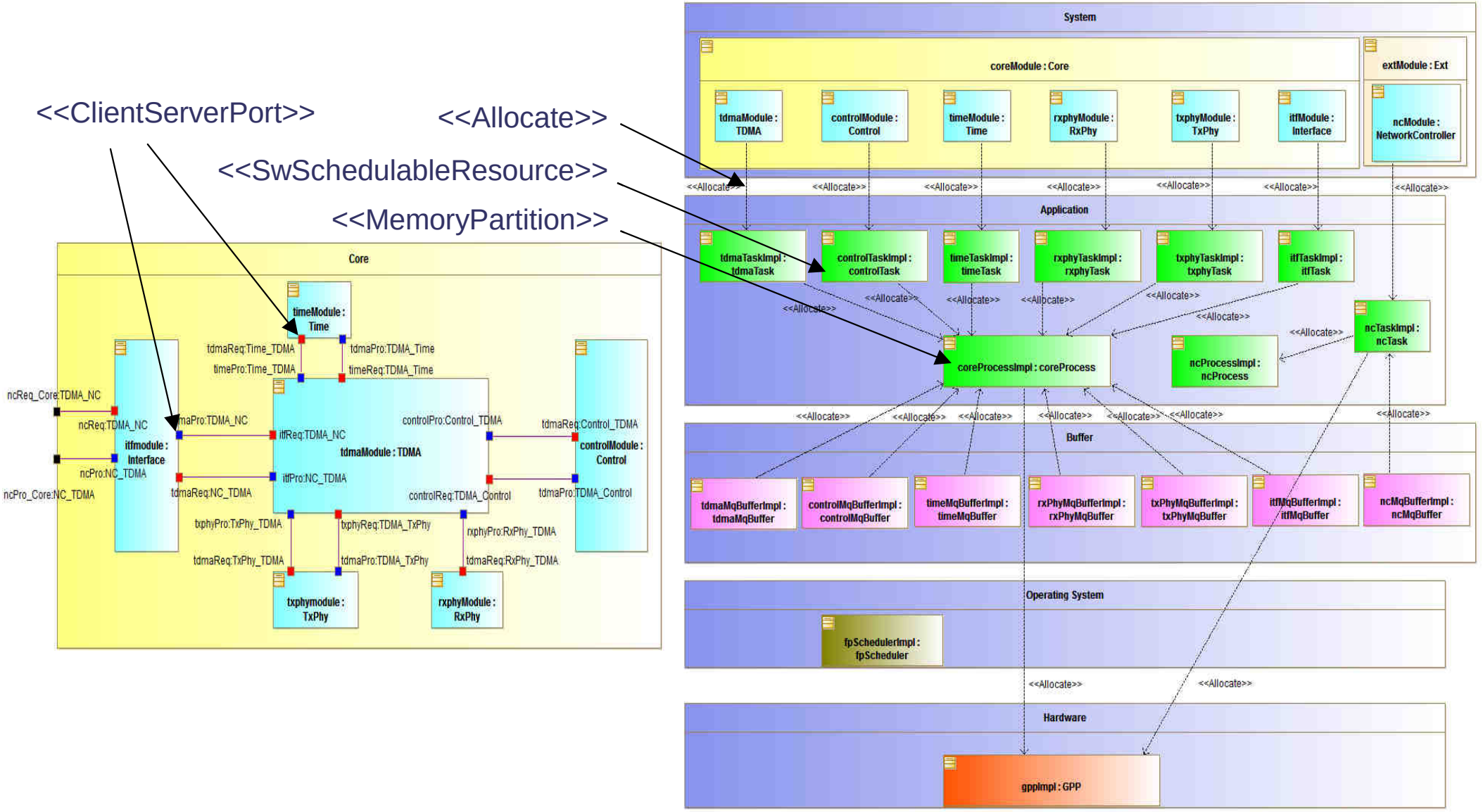


3. Application MARTE model



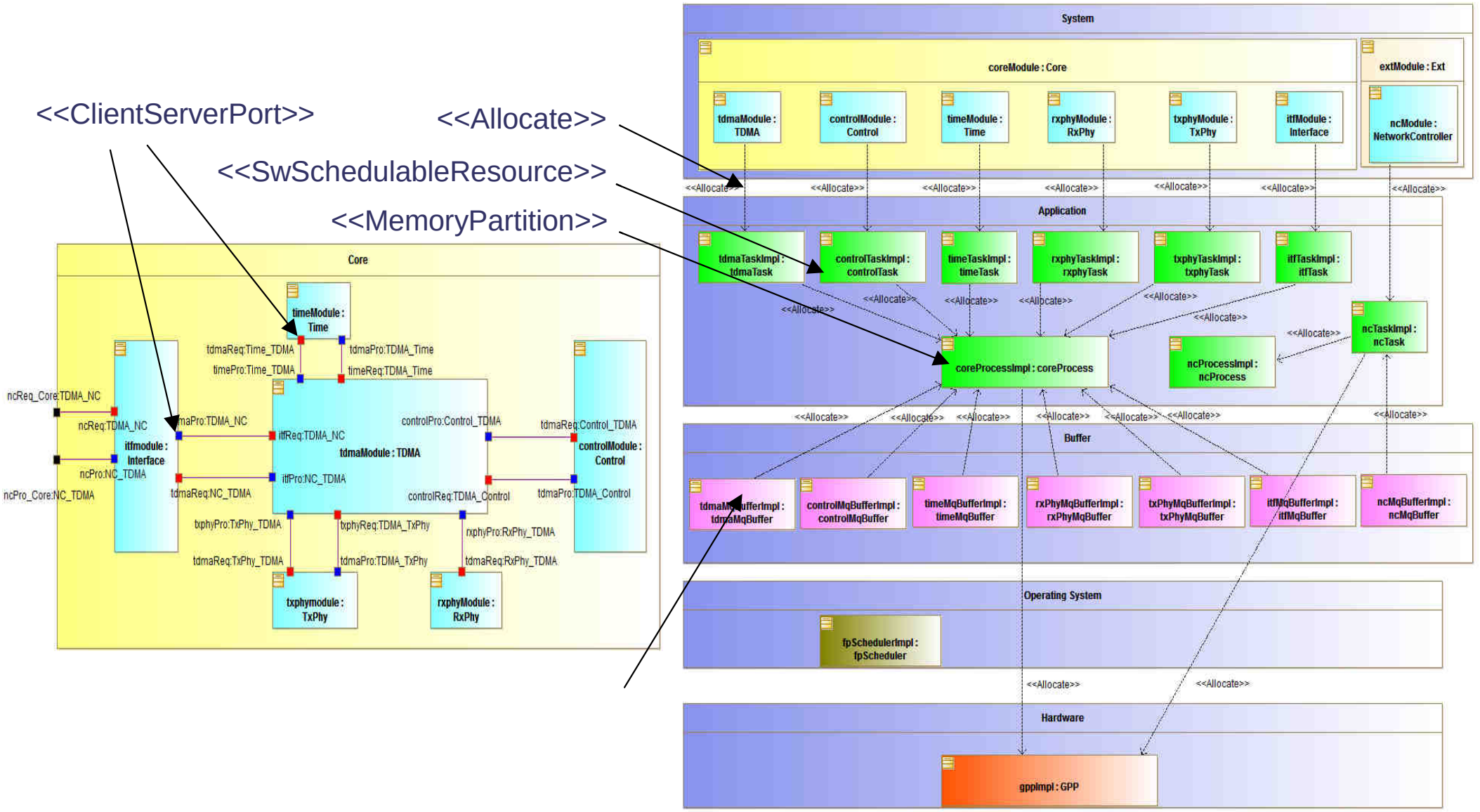
MARTE stereotypes

3. Application MARTE model



MARTE stereotypes

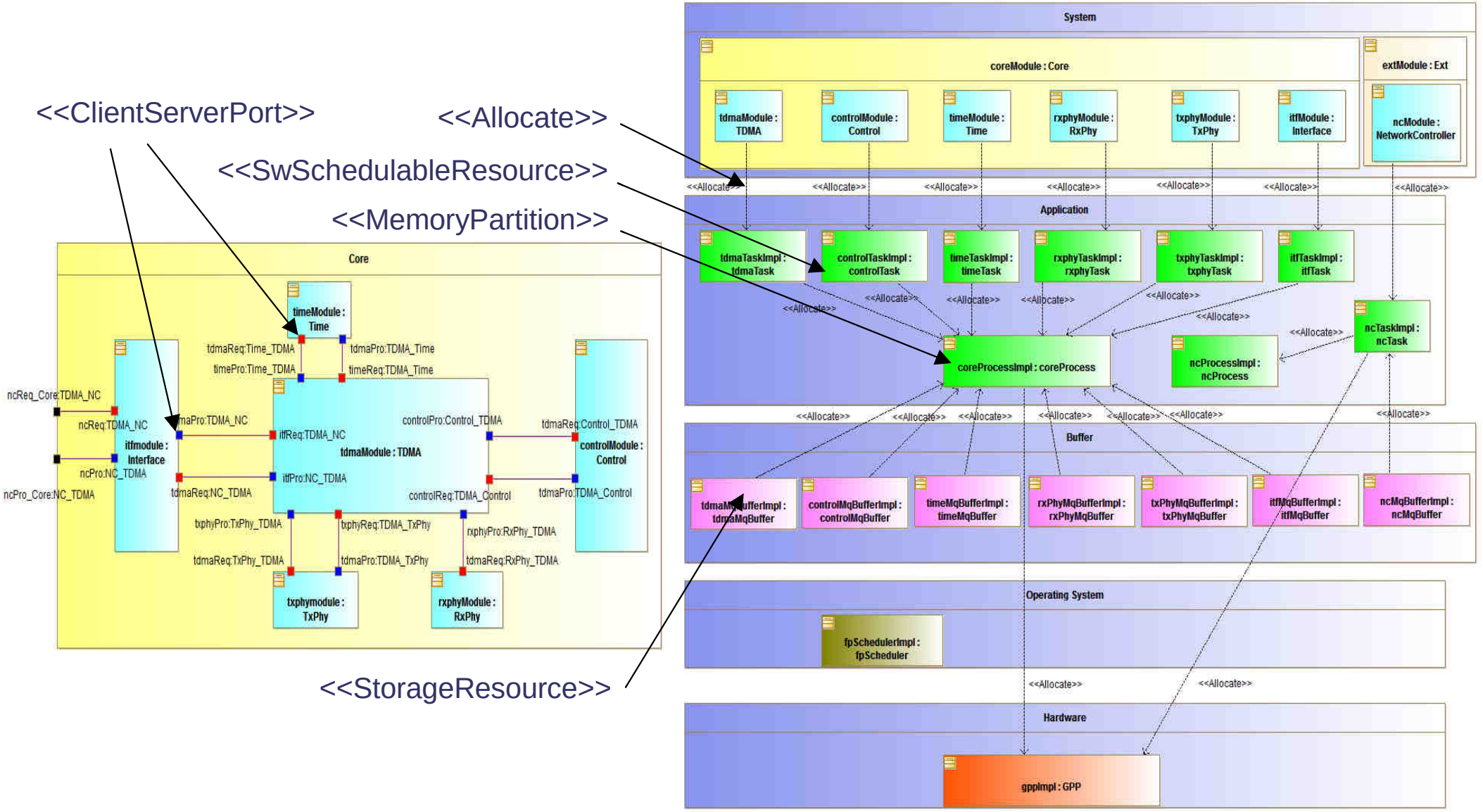
3. Application MARTE model



THALES

MARTE stereotypes

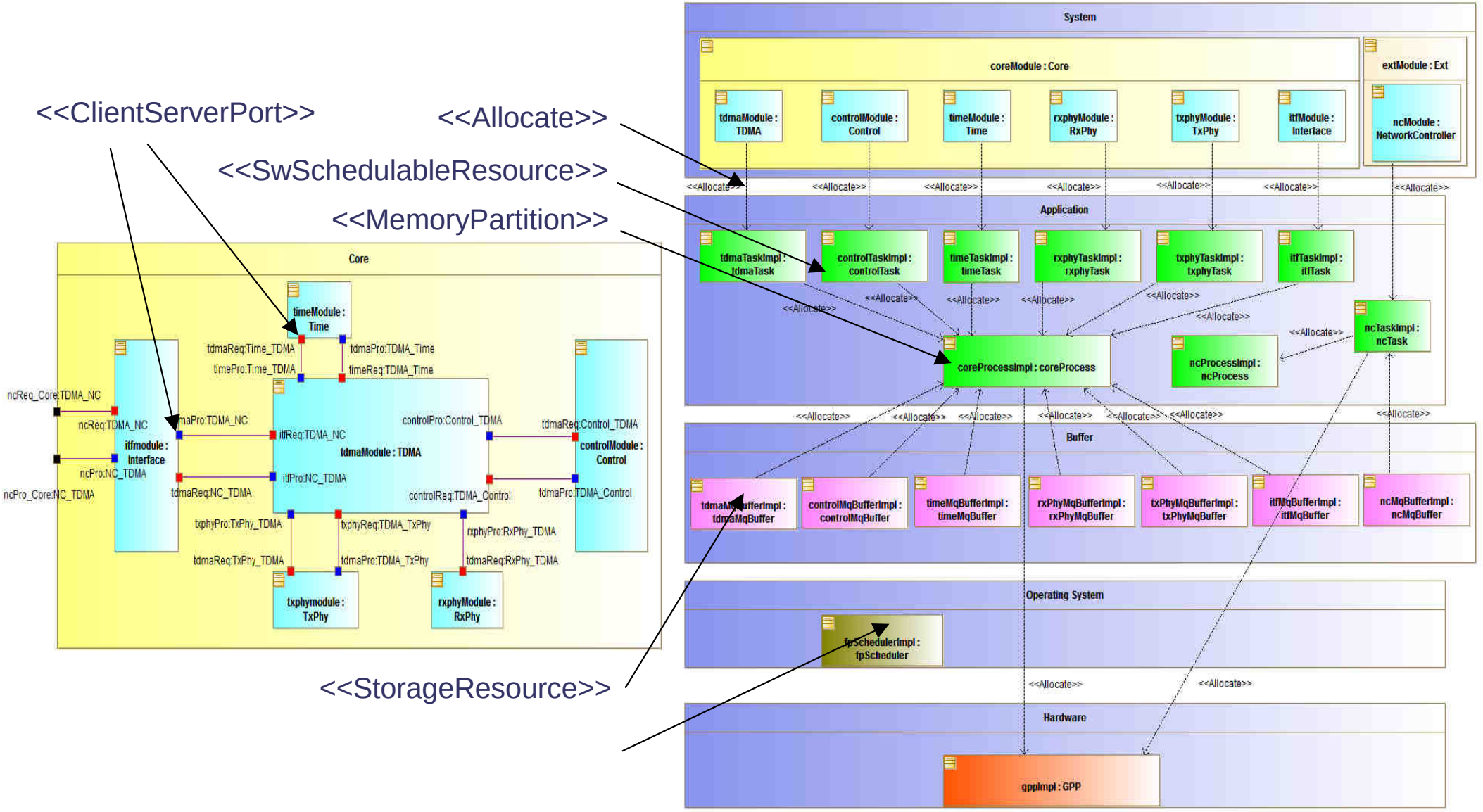
3. Application MARTE model



THALES

MARTE stereotypes

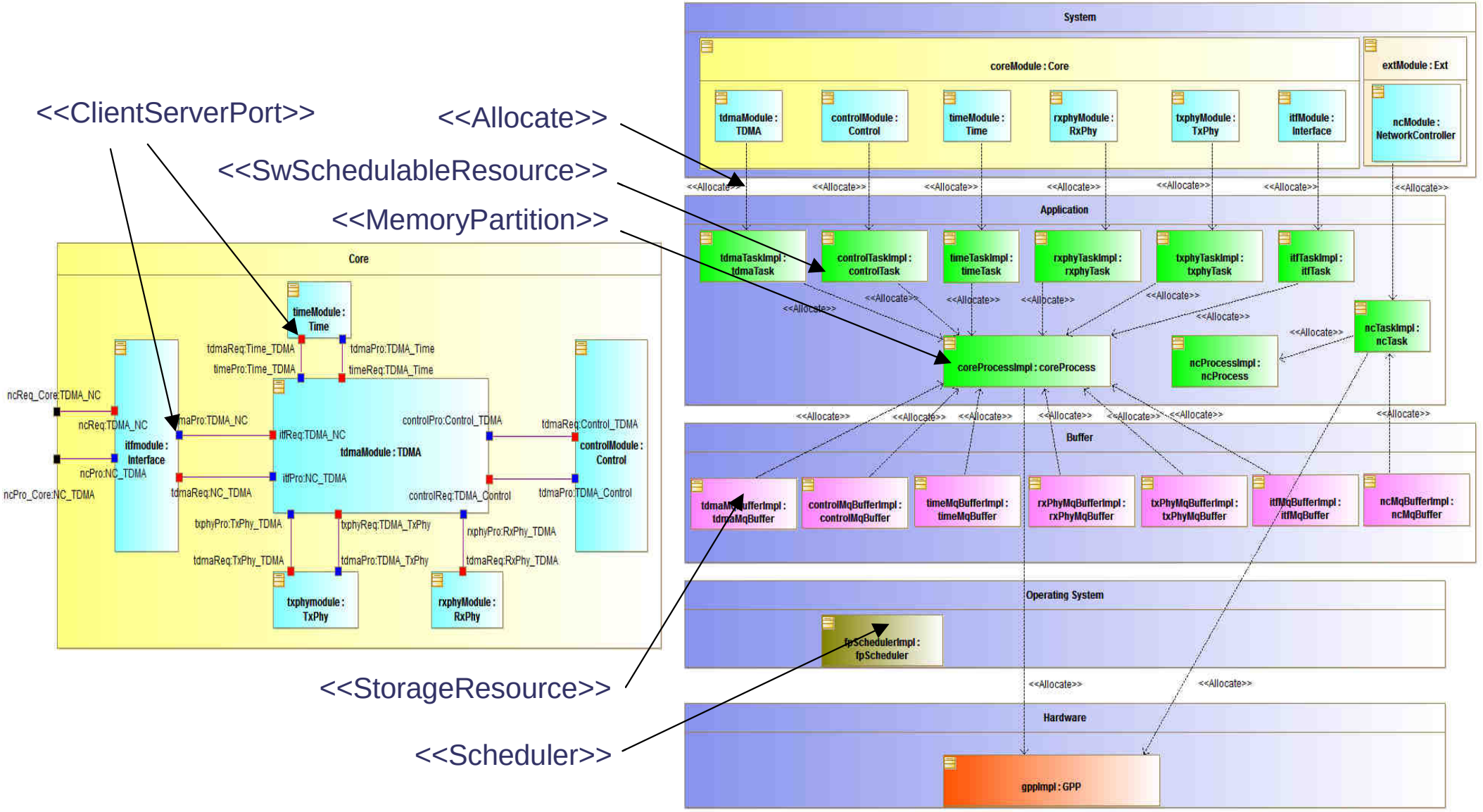
3. Application MARTE model



THALES

MARTE stereotypes

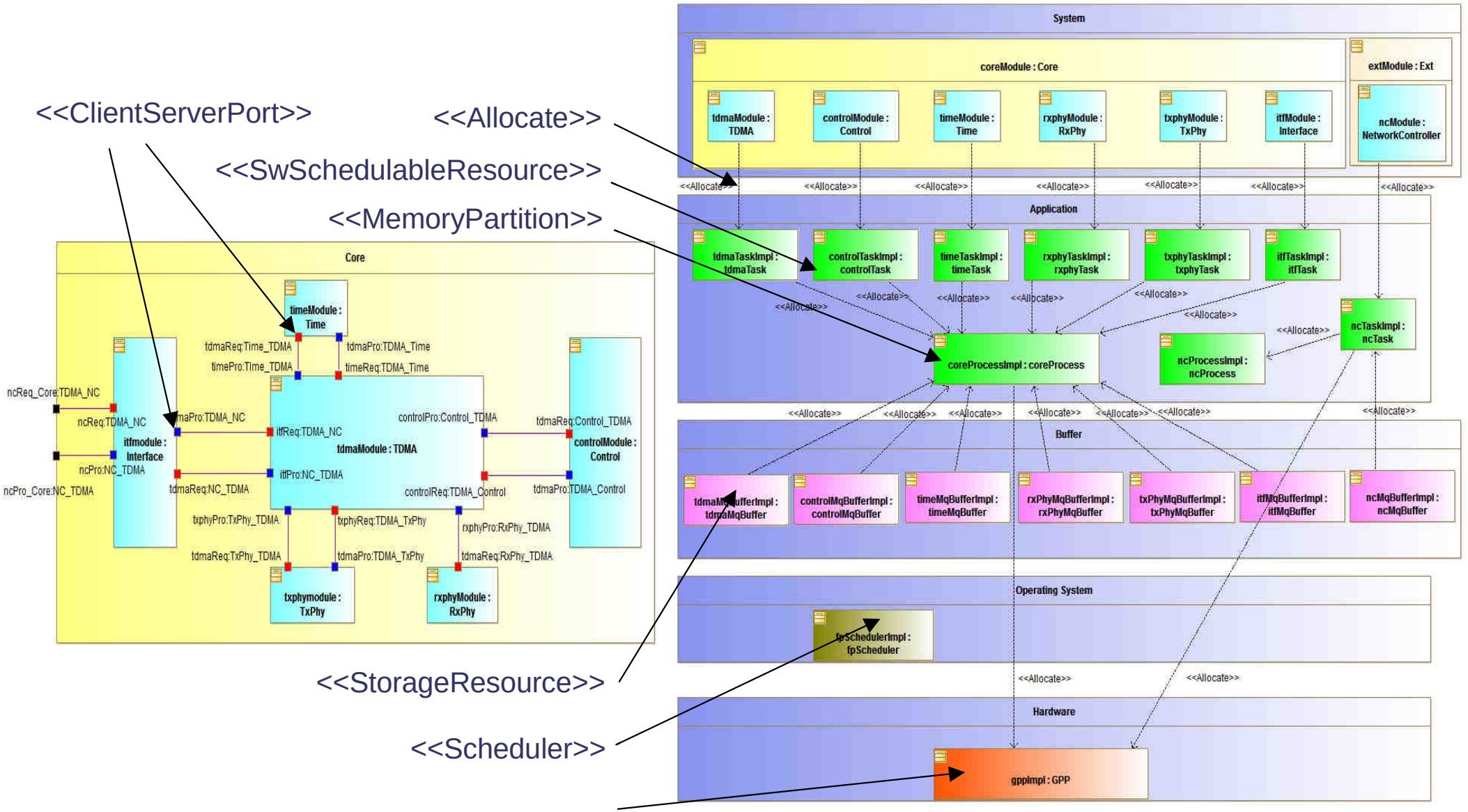
3. Application MARTE model



THALES

MARTE stereotypes

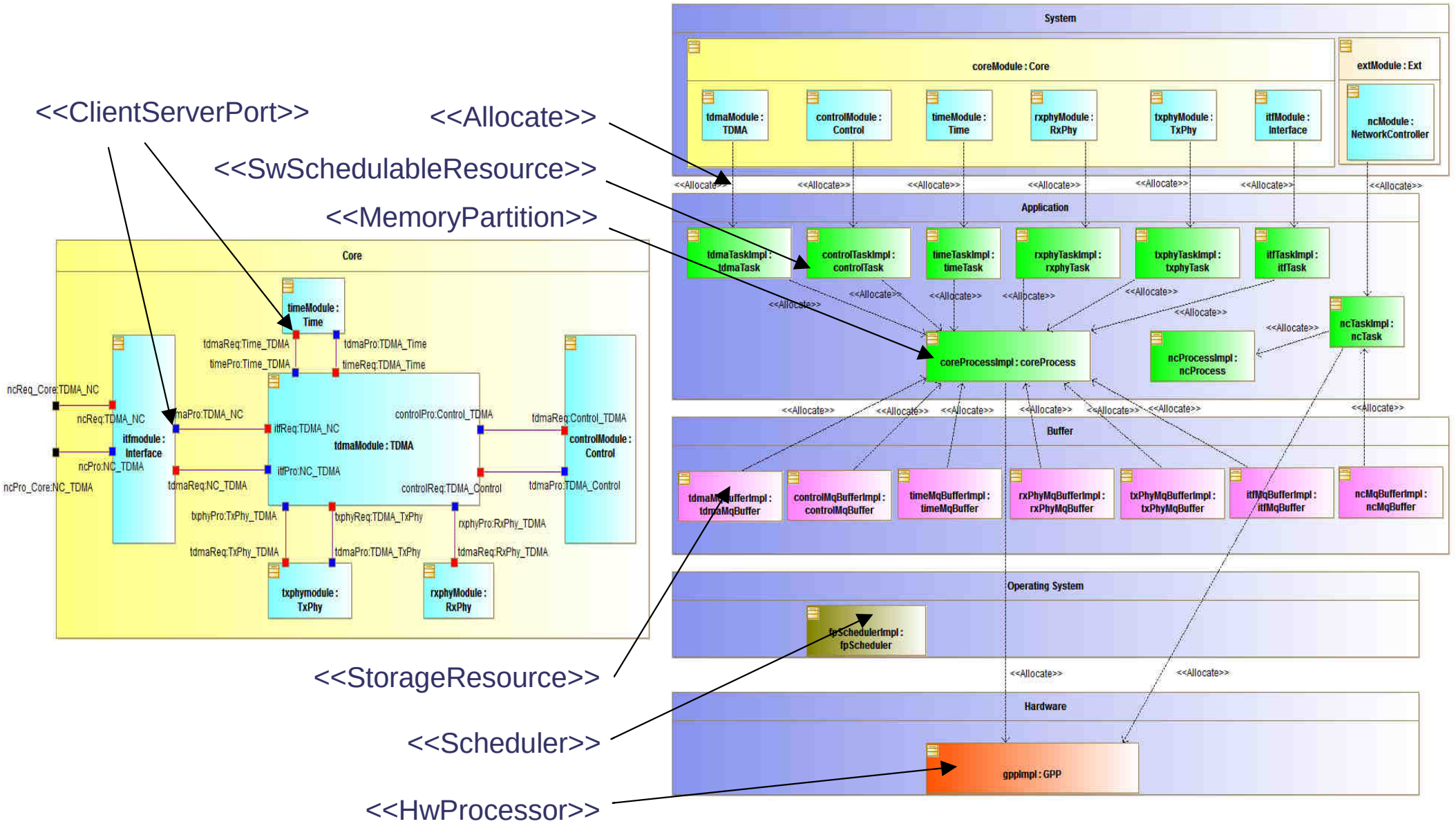
3. Application MARTE model



THALES

MARTE stereotypes

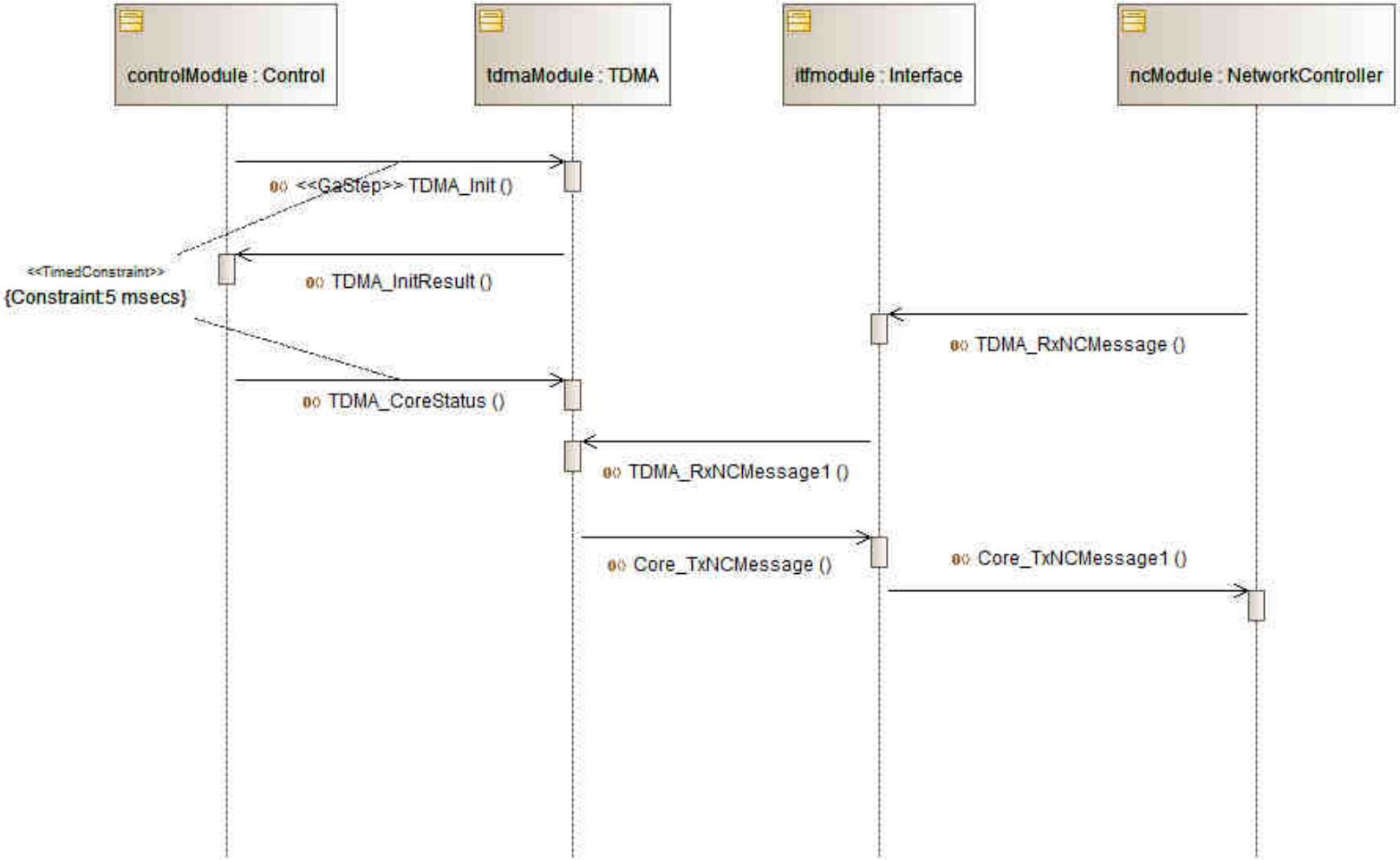
3. Application MARTE model



THALES

System behavior specification

3. Application MARTE model



THALES

Tools for traces

4. Trace generation and analysis

Specification trace

- **Model to text transformation from sequence diagrams:**
  - Implemented as an Eclipse plugin
  - Events, dependencies, duration constraints

Execution trace

- **Use of TAU to obtain execution traces:**
  - Code instrumentation:
    - PDT for code analysis
    - TAU for instrumentation and compiling
  - Execution on board for raw traces
  - Filter raw traces and present in a readable format
  - Instant time, function start/end, thread and cpu info

Developed tool to compare execution and specification traces:
- Event order
- Duration between events

THALES

Conclusion and future works

Automatic instrumentation from models

- Add new stereotypes to ports in order to add instrumentation points automatically in methods of the generated code.

Data values in execution traces

- Function parameters for PDU analysis
- Messages sent/received (e.g. structures exchanged by message queue)

Traces to model

- Use execution traces to automatically complete the model with quantitative and non-functional properties

Host and target execution traces exploitation

- Determine target timing information from host execution traces

Q & A

Thank you for you attention.

Shuai.Li@fr.thalesgroup.com

THALES