Jean-Philippe DELAHAYE

Frédéric LE ROY
Joël CHAMPEAU

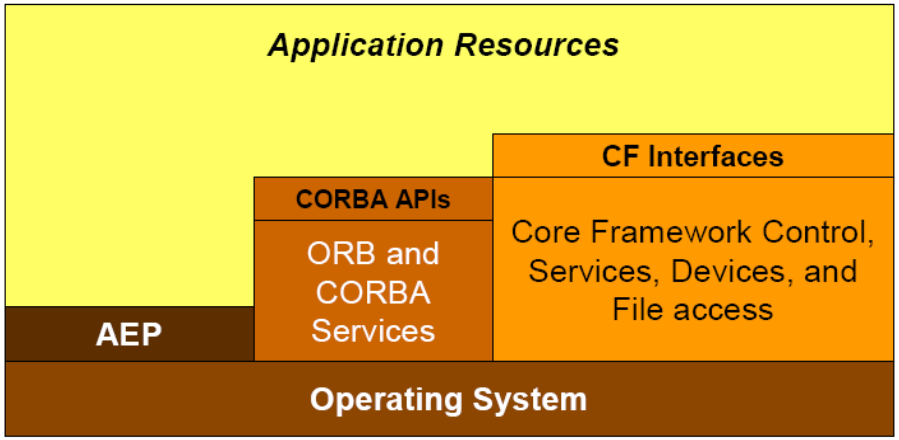
A MODEL BASED METHODOLOGY FOR SCA WAVEFORM DESIGN ENHANCING PORTABILITY

APPLICATION TO THE FM3TR WAVEFORM APPLICATION

Ecole Nationale Supérieure de Techniques Avancées Bretagne - 2011

STUDY CONTEXT

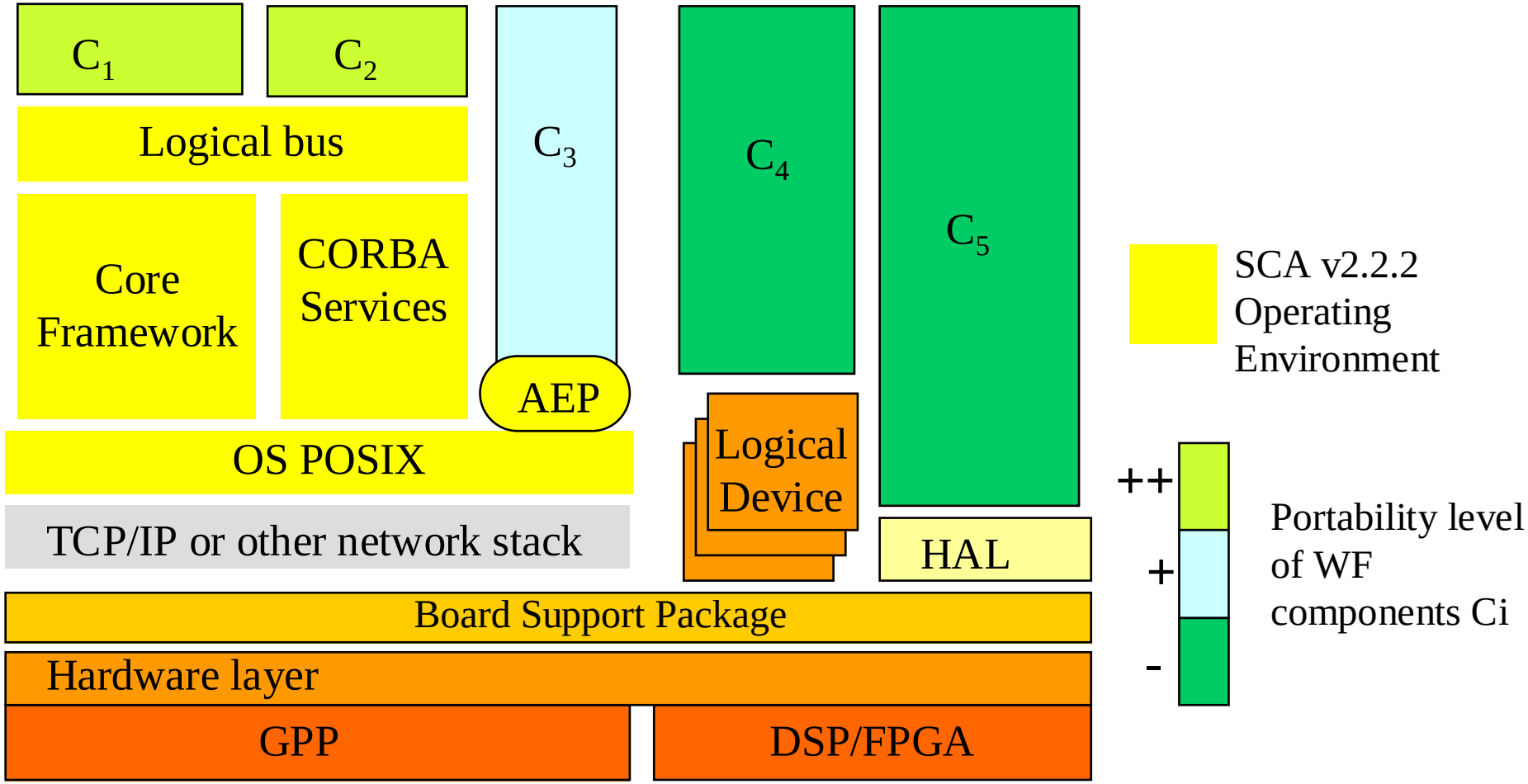
- Military SDR context
  - JTRS standard
    - SCA 2.2
    - SCA Next proposal
  - ESSOR EDA project
- SCA Software content



(From SCA 2.2.2 spec)

SCA Specifications: Operational Environment Architecture

- Different levels of code portability over heterogeneous hardware

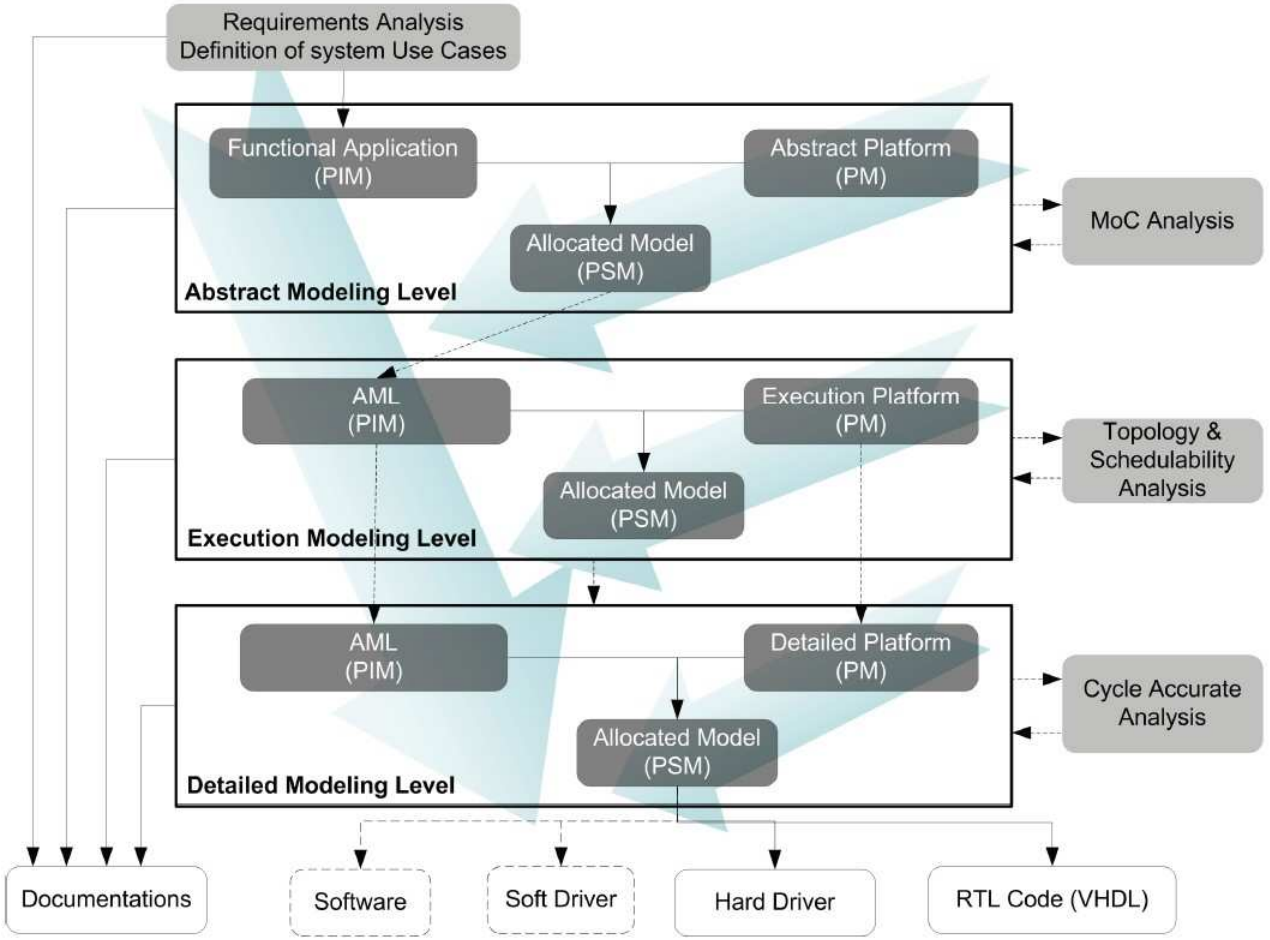


PROJECT GOALS

- Use Model Driven Architecture for waveform development.
- Why ?
  - For CIM, PIM, PSM separation (portability)
    - System, functional, platform requirements
  - For model checking
    - Design rules, certification rules (standard), performance rules
  - For model transformation
    - Model browser
    - Model standardization to facilitate model exchange (re-use)
    - Code and documentation generation
    - Compute metric
  - For tool chain instrumentation
    - Automated processes

MoPCoM PROCESS

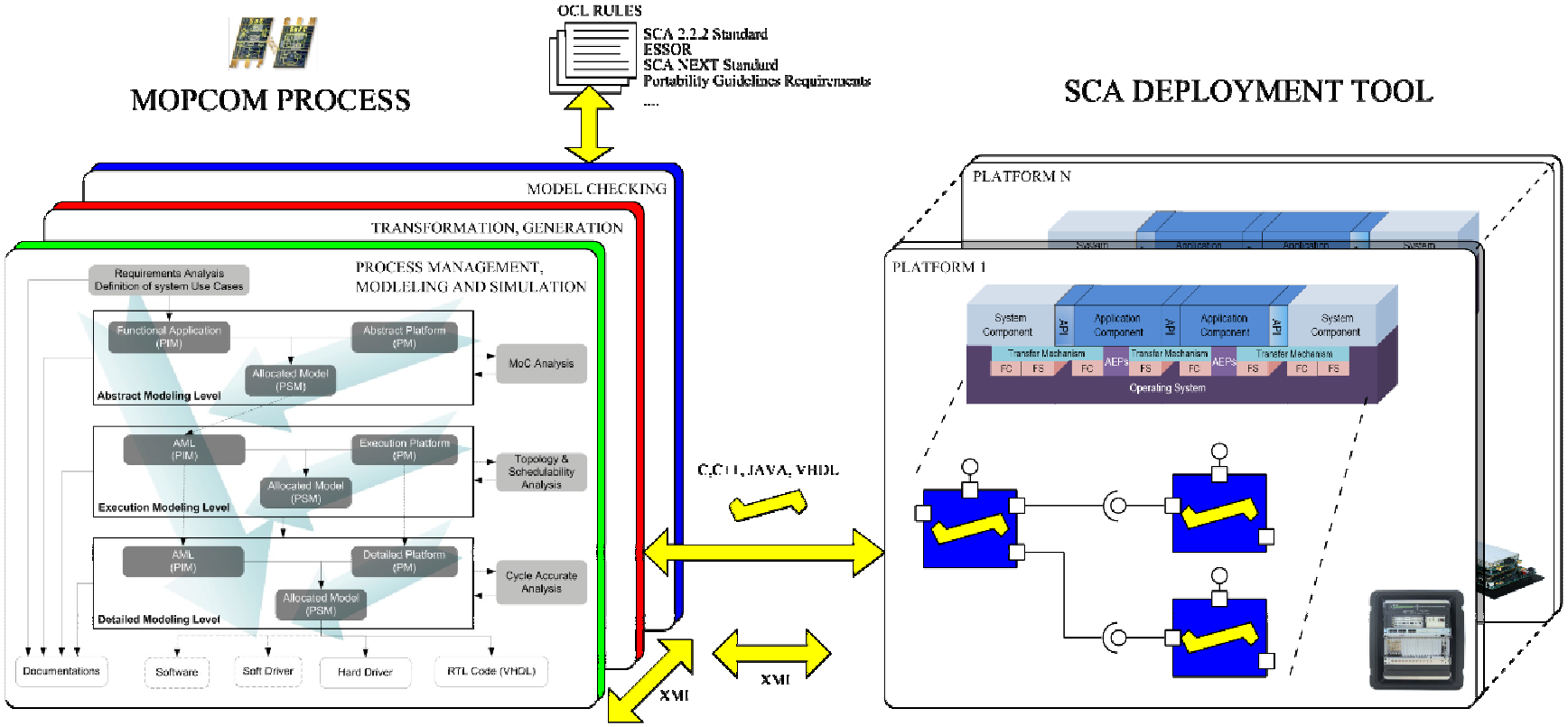
- A methodology defined to develop SoC/SoPC applications based on UML and MDD



MoPCoM PROCESS

- A structured iterative process of modeling :
  - The Abstract Modeling Level (AML) is intended to provide the description of the expected level of concurrency and pipeline through the mapping of functional blocks onto a virtual execution platform,
  - The Execution Modeling Level (EML) is intended to provide a generic platform defined in term of execution, communication or storage nodes in order to proceed to coarse grain analysis,
  - The Detailed Modeling Level (DML) is intended to provide a detailed description of the platform in order to proceed to fine grained analysis. It allows RTL code generation for harware (VHDL) and software (C) parts including glue logic (drivers).”

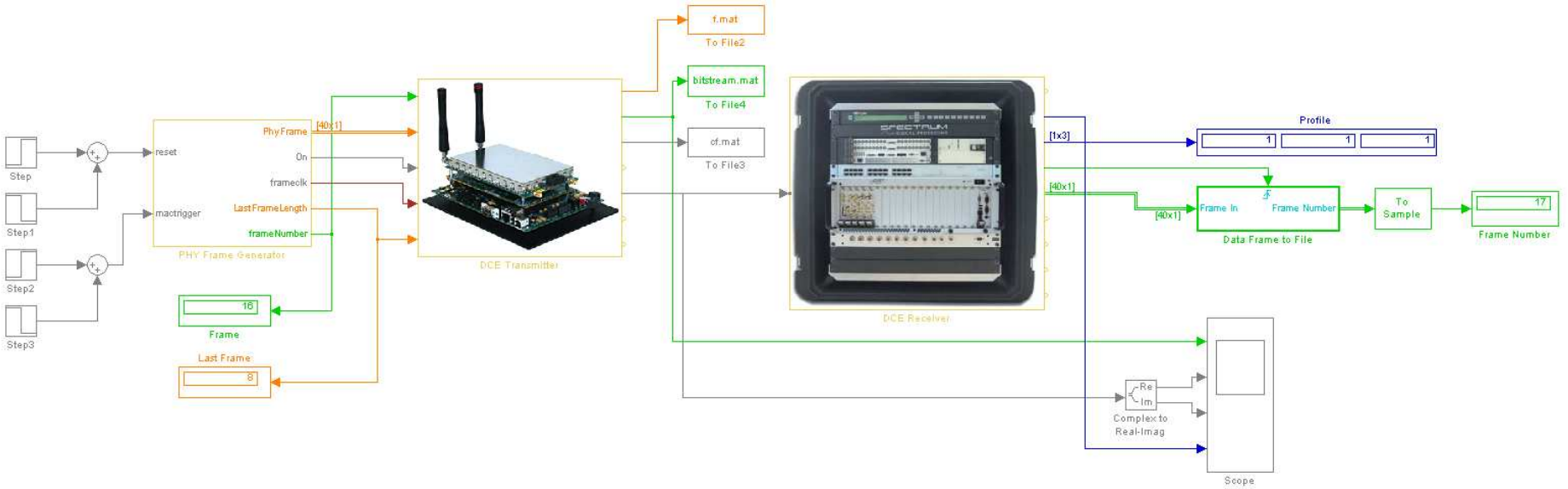
MoPCom PROCESS BASED

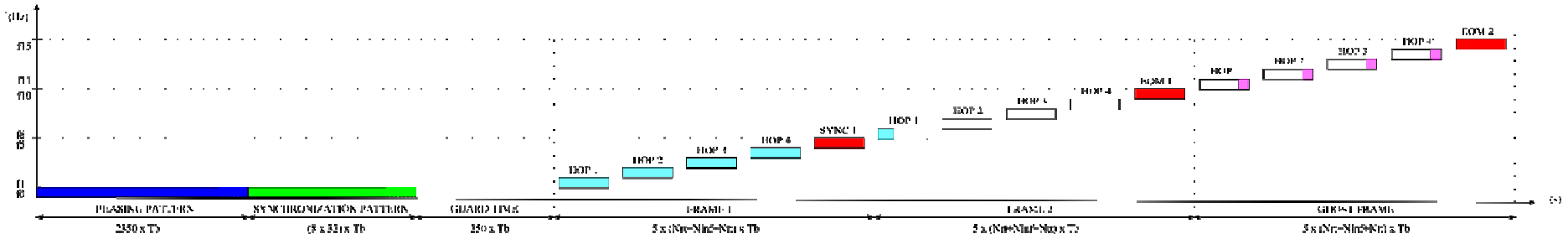


MoPCom PROCESS BASED

- Tool chain
  - SCA specific tool
    - Deployment process
      - Components instantiations and configuration
      - Port connections and mappings
  - MoPCom process tool
    - PIM modeling by UML modeler
    - Design checking, standard checking by model checker
    - SystemC generation by code generator for simulation purpose
- Model import or export by XMI

FM³TR CASE STUDY





FM³TR CASE STUDY

- Experiments feedback
  - Simulink model
    - Can produceTest vector for layer 1 of OSI model
    - Difficult to model waveform over layer 1
      - Simulink MoC model can't be configure (SDF, Kahn, CSP, …)
    - Difficult to generate C with RTW with our model
      - Simulation engine configuration (Variable-set vs. Fixed-Step)
  - Waveform model
    - Must be executable on virtual platform before deployment
      - Difficult to maintain virtual platform
        - » Code generation

Conclusion and Future Works

- Model Based methodology to enhance waveform portability

- An ongoing project :
  - Waveform Model browser (under construction)
  - Design rules, standard rules (under formalization)
  - Portability metrics (under definition)

Thank you for your attention !

Questions ?

Comments ?