



A Schedulability-Aware Execution Framework for MARTE-based Models

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CEA LIST

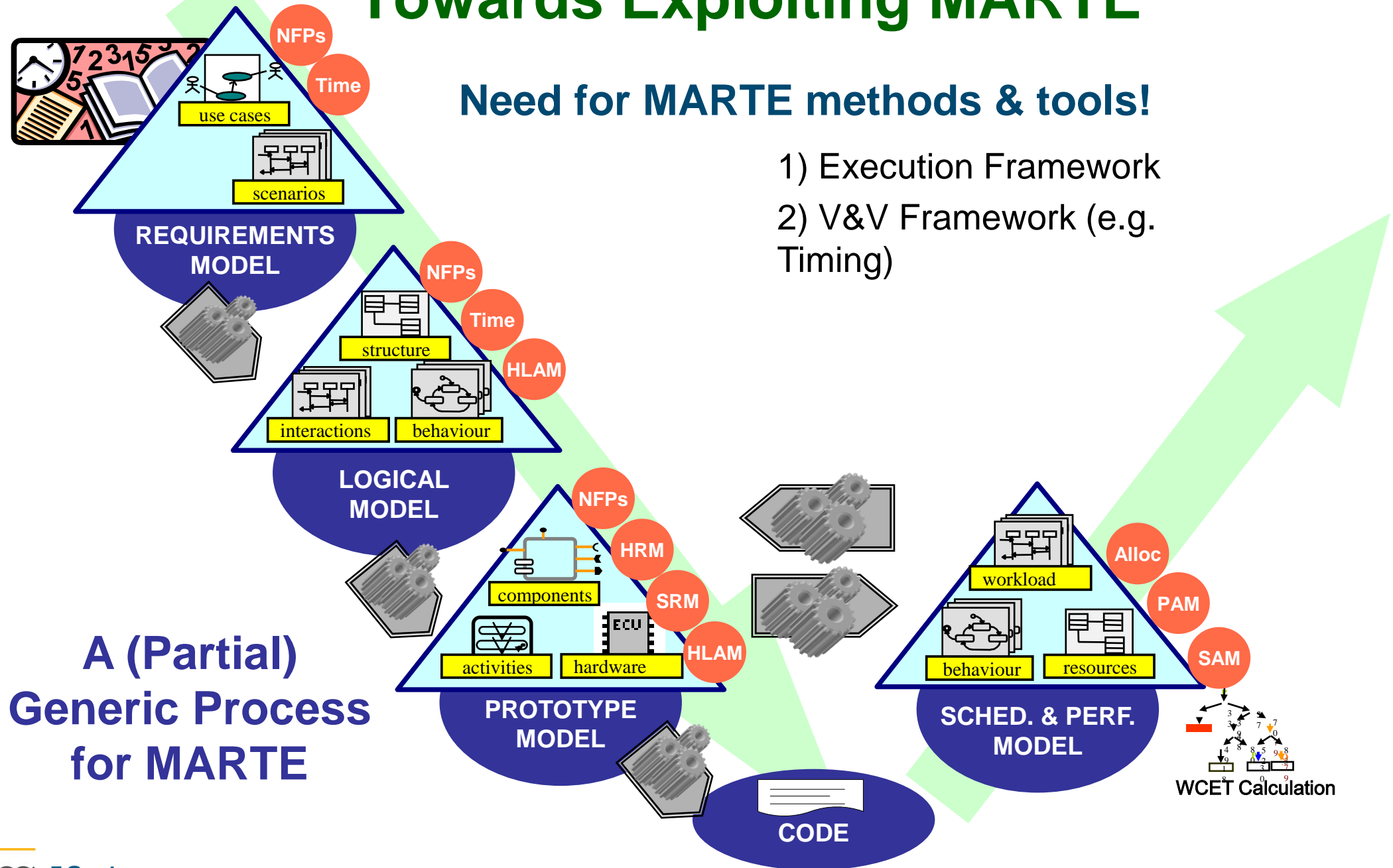
MARTE Information Day

Ottawa, June 26th 2008

Towards Exploiting MARTE

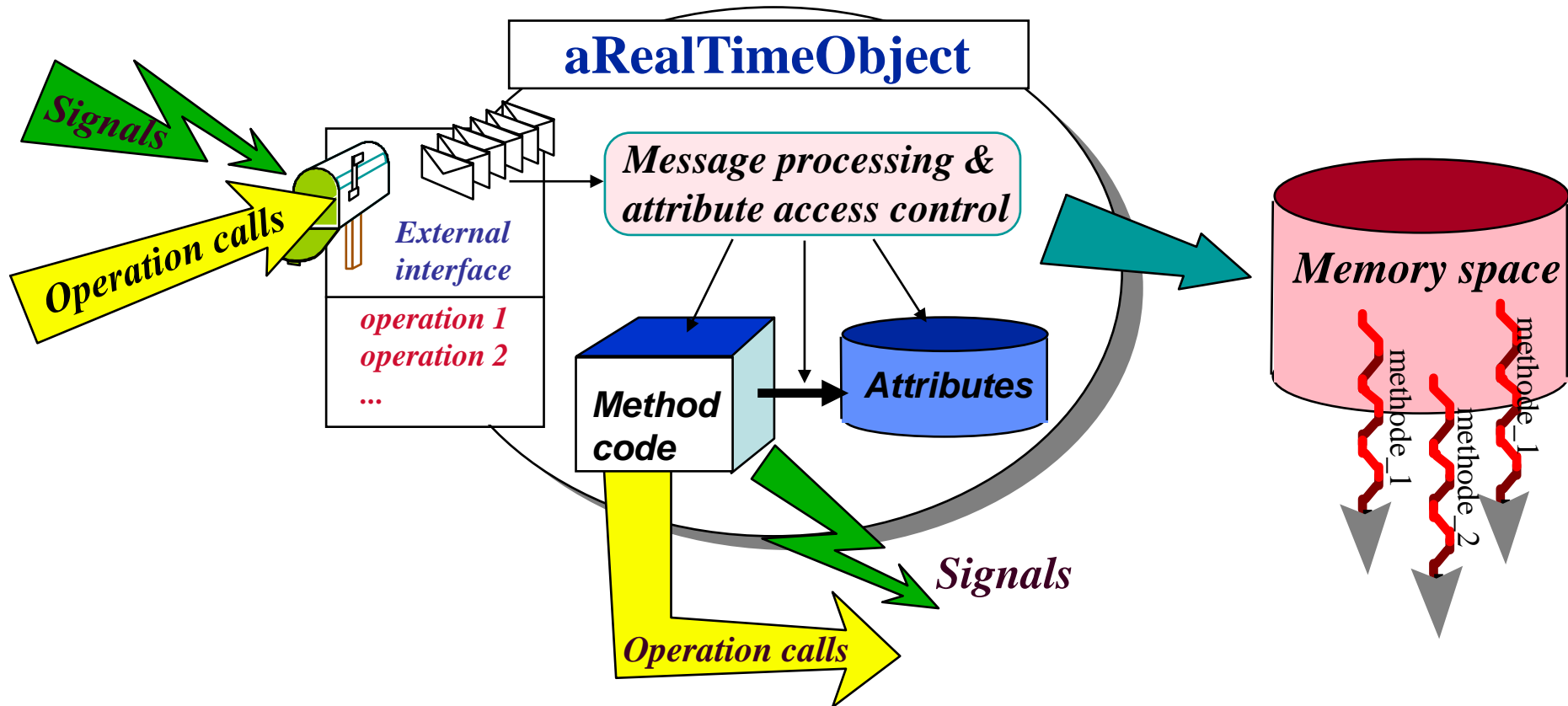
Need for MARTE methods & tools!

- 1) Execution Framework
- 2) V&V Framework (e.g. Timing)



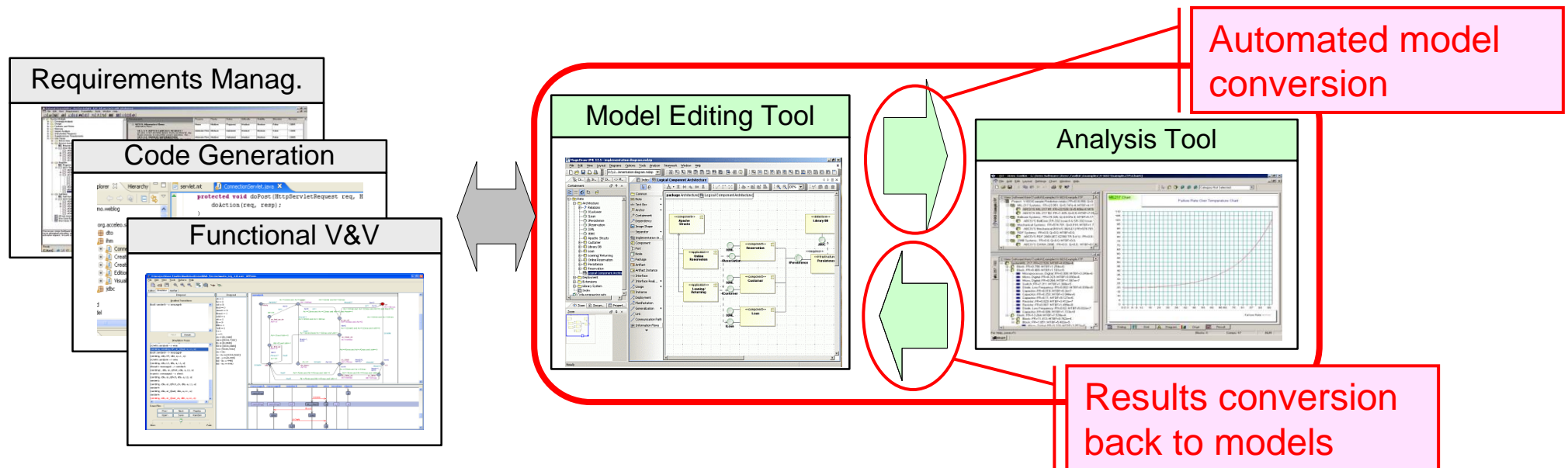
1) Execution Framework: ACCORD

- *We target a particular Model of Computation → ACCORD approach*
- *Based on the Active Object pattern (others: Rhapsody, Rose RT)*
- *Use a restricted MARTE RTEMoCC to build well formed models*

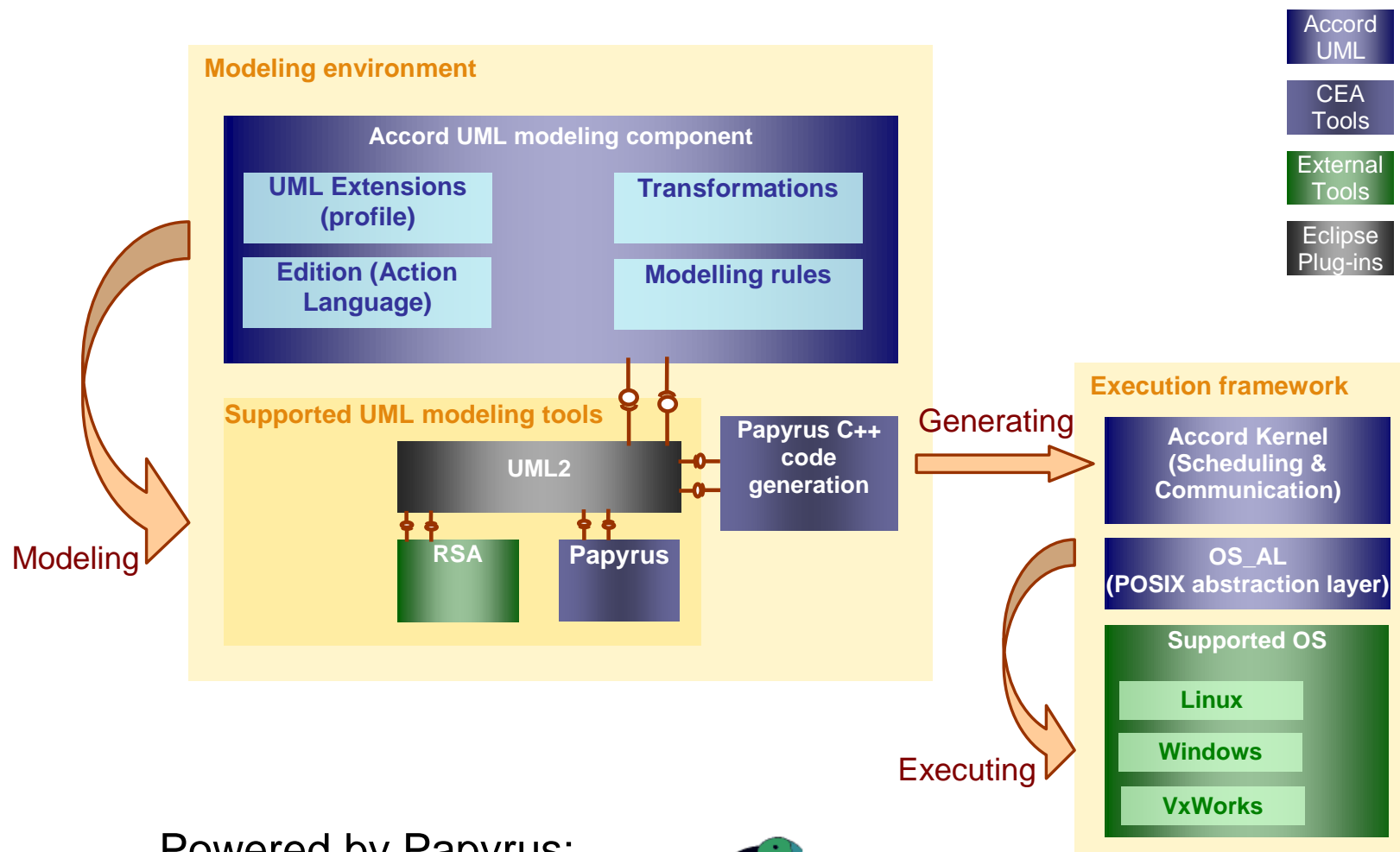


2) V&V Framework (e.g, Timing)

- For avoiding **timing problems** (overload, miss deadlines, ...)
- For **dimensioning** resources
- For **optimization** of application-platform deployment
- **Automate** the generation of analysis models (time savings!)



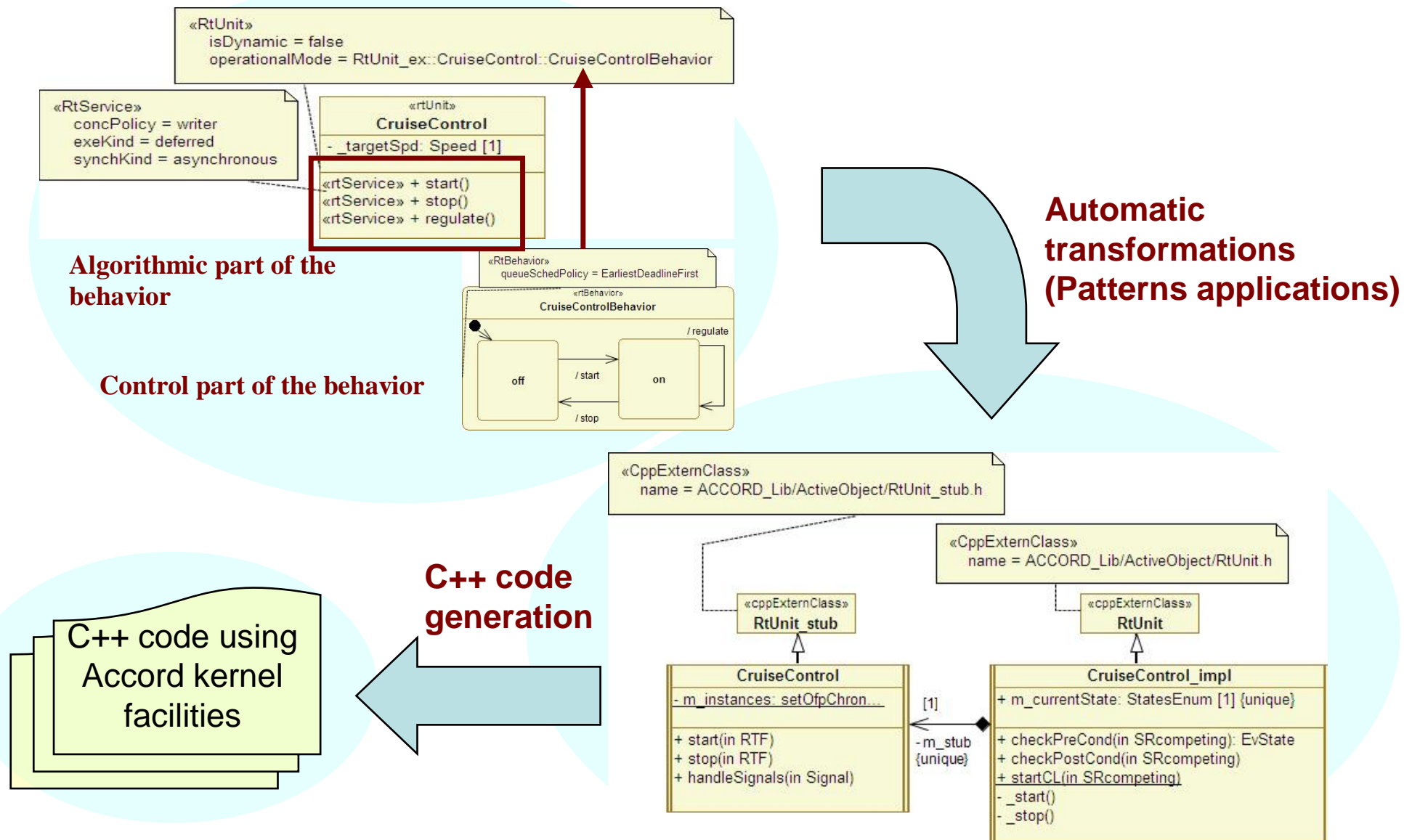
ACCORD Framework Architecture



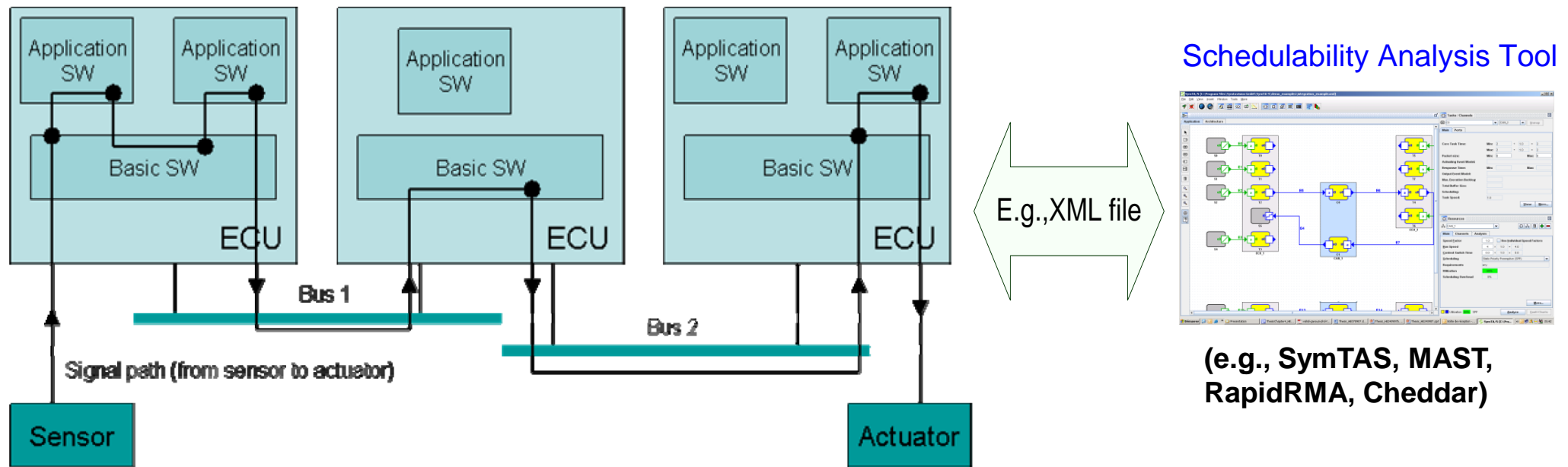
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From MARTE models to RT executable code

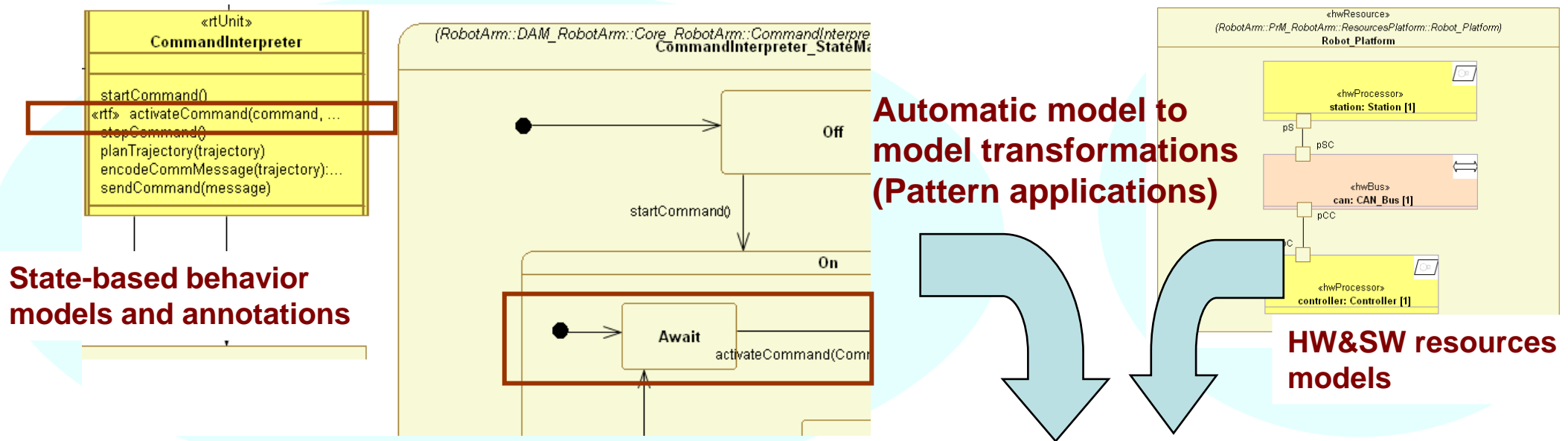


Model-Based Schedulability Analysis

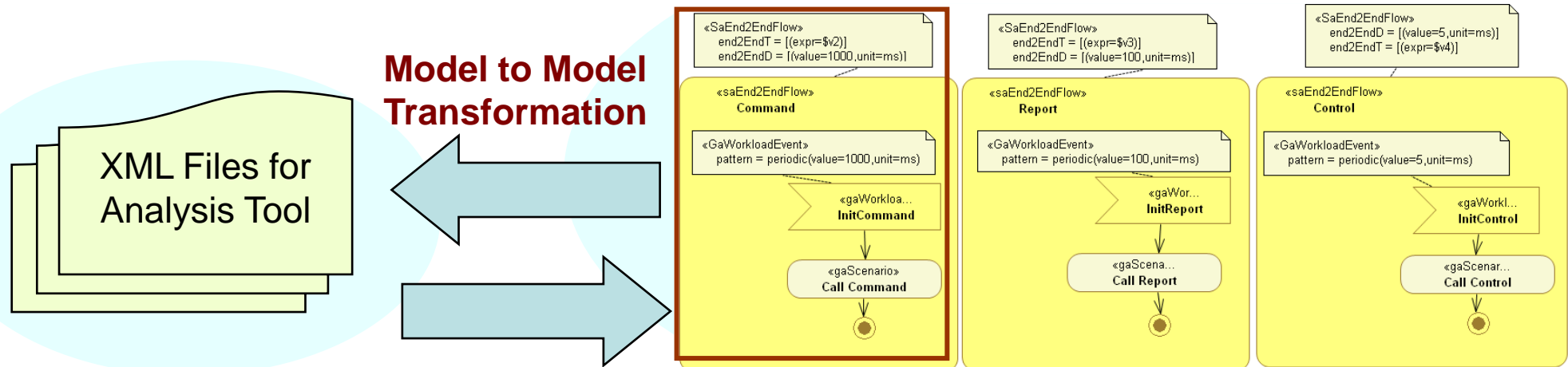


- ✱ Calculation of response times (function exec./message transmission):
 - ➔ End-to-end timing chains (e.g., from sensor to actuator over a network)
- ✱ Taking into account timing dependencies...
 - ➔ preemptions, blocking, buffering, data-dependent execution times,...
- ✱ In order to study timing problems...
 - ➔ Overload, miss deadlines, buffer overload, stability of distributed control

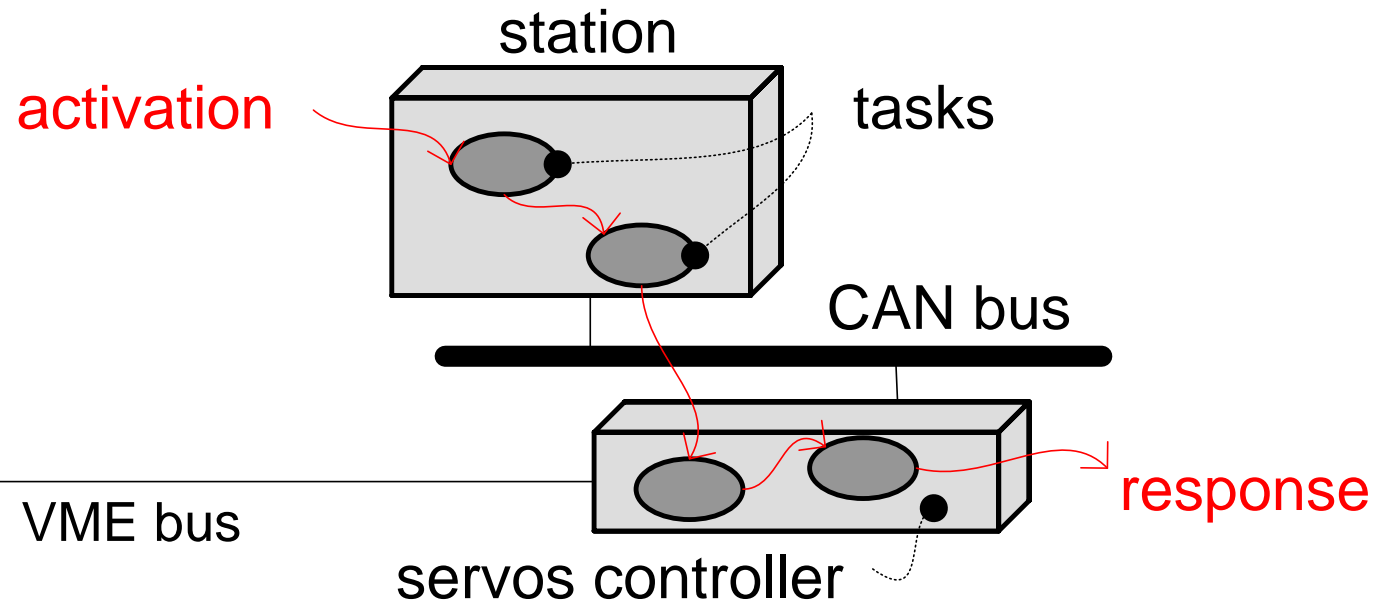
From MARTE models to Analysis input files



Scenario-based behavior models and annotations



Example: A Robot Arm

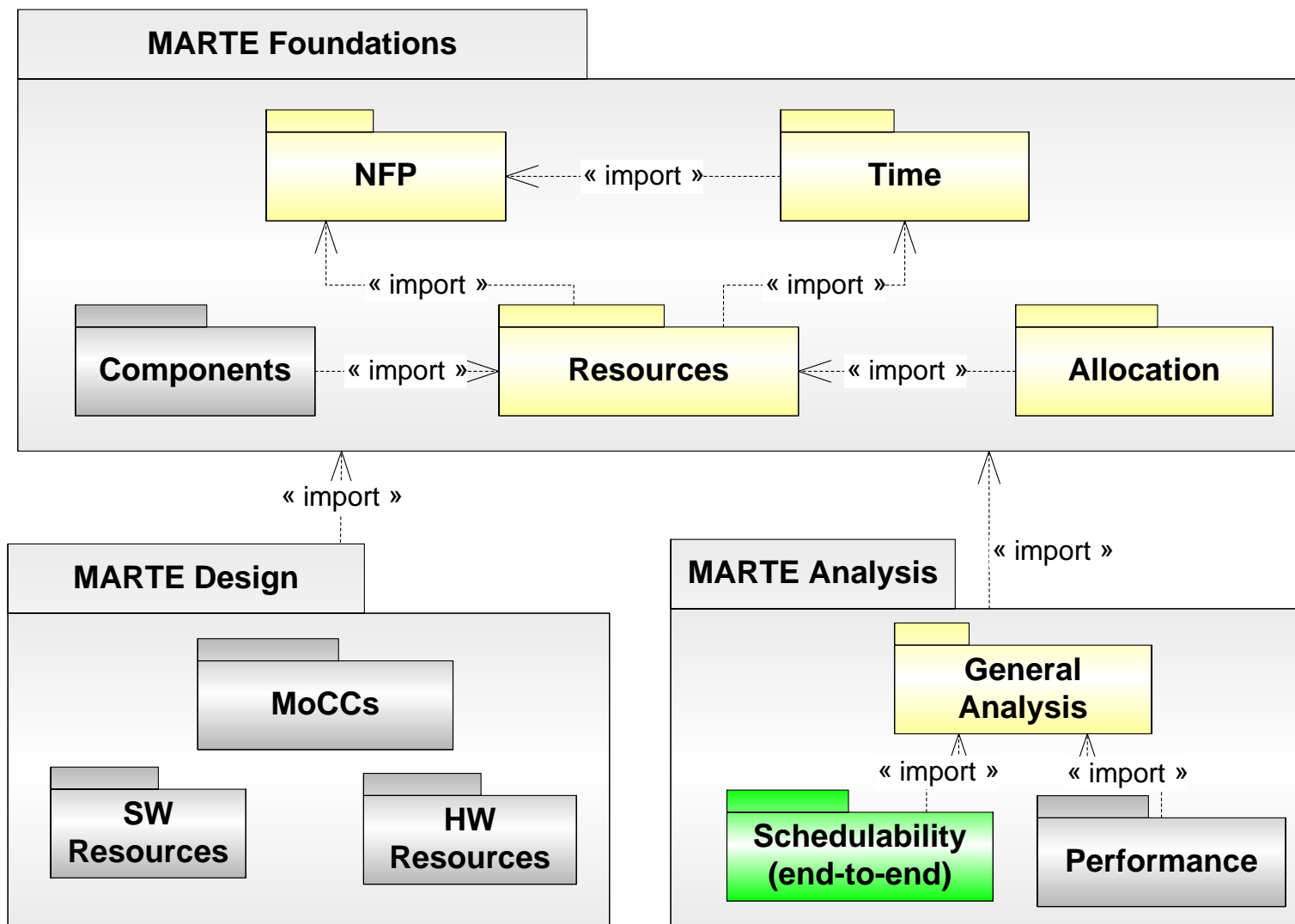


- ✳ Industrial Robot Controller project (University of Cantabria)
- ✳ 3 end-to-end flows
 - ➔ Refresh Report, Control Arm, Send Command
 - ➔ Periodic activation (5 ms, 100 ms, 1 s)
- ✳ Evaluate end-to-end deadlines
 - ➔ Deadlines = activation period

Demo

Backup Slides

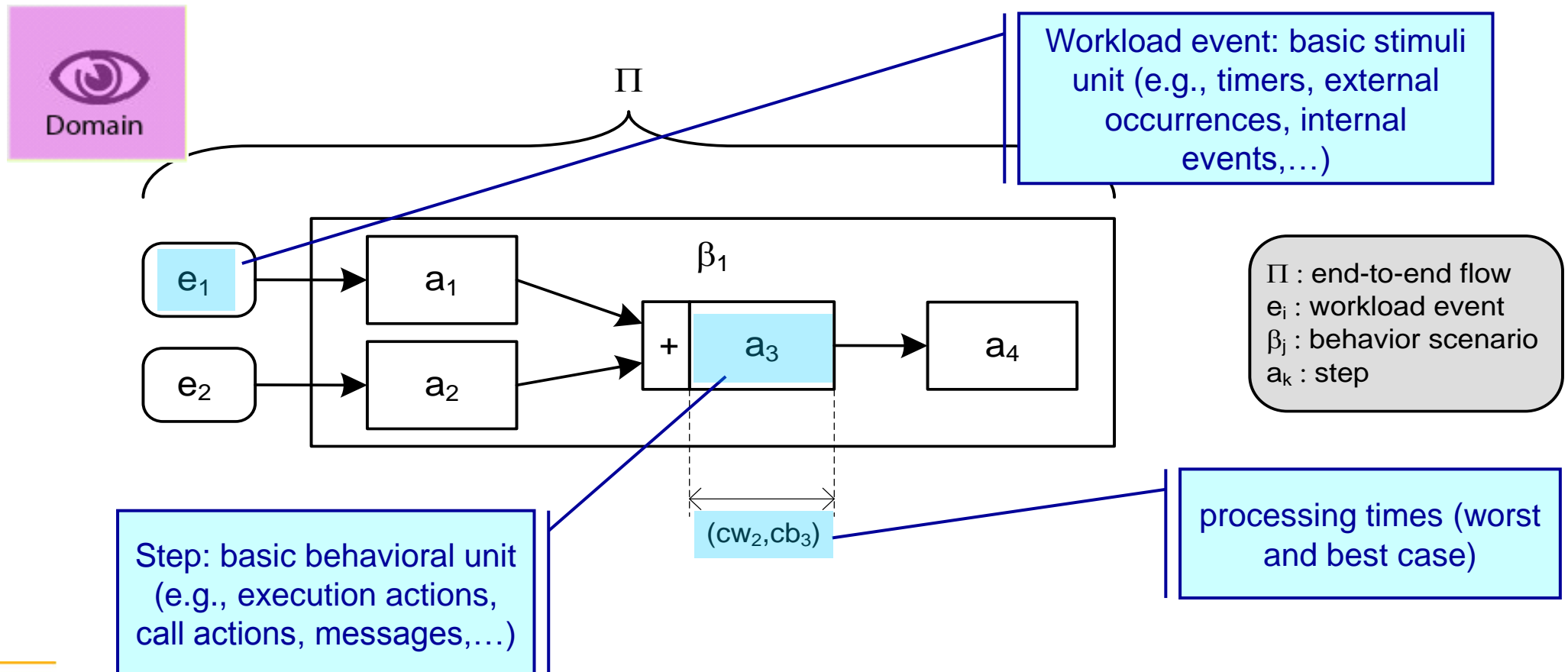
Context of the SAM Sub-profile



The Notion of End-To-End Flow

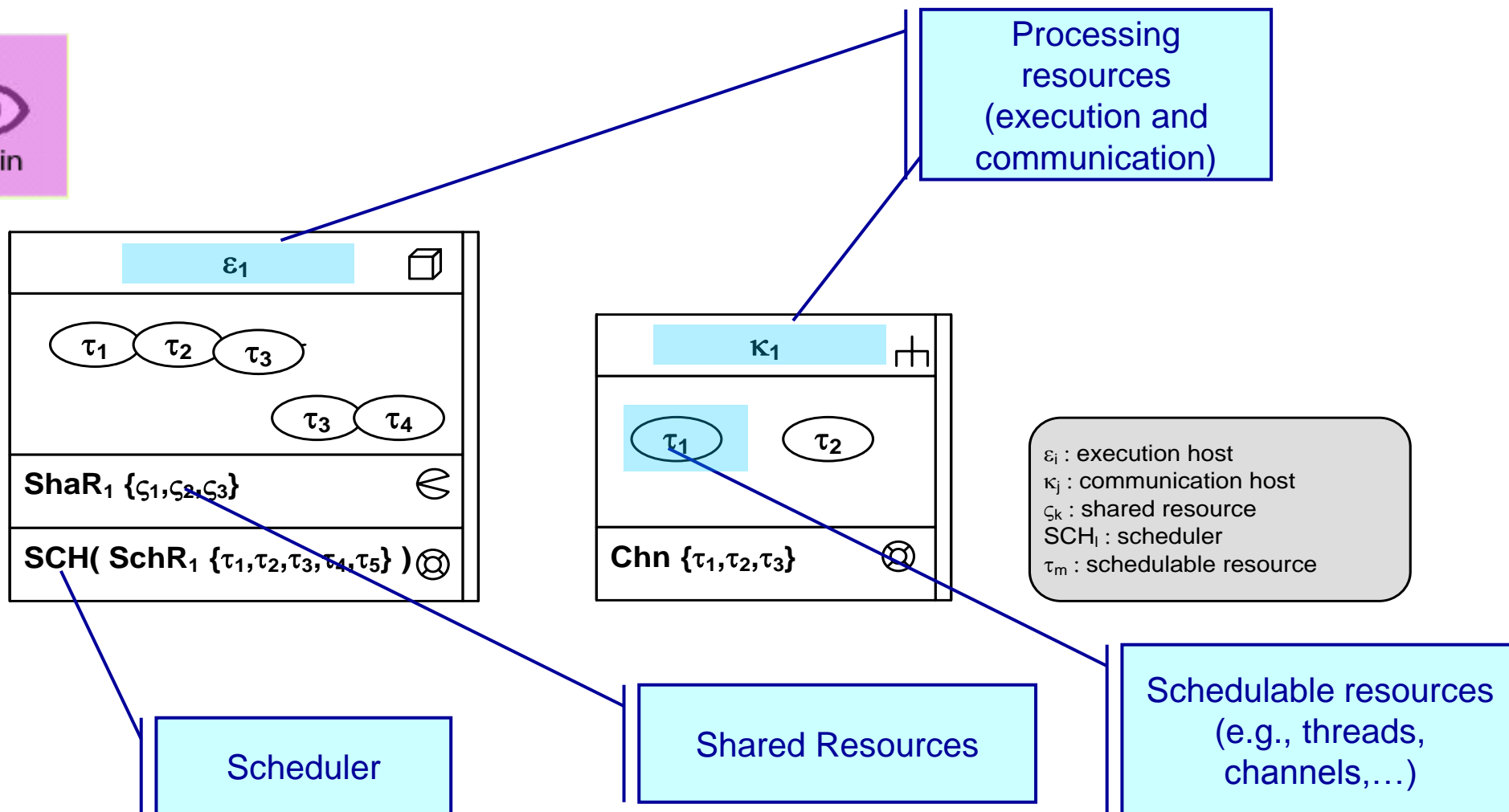
An “End-To-End Flow” is the basic workload unit to evaluate

→ An end-to-end flow refers to the entire causal set of steps triggered by one or more external workload events.



Resources Concepts

- Provide additional (analysis-specific) annotations to annotate resources platform models



Analysis Context concepts

- An analysis context is the root concept used to collect relevant quantitative information for performing a specific analysis scenario.
- An analysis context integrates workload behavior models and resources platform models.

