

PRiME Demonstrator (2018) – Theme 2 Formal Model-Driven Developments:

Code generated learning-based RTM as plug&play element within the PRiME framework

Prediction:
Exponential Weighted Moving Average (EWMA)
Decision Making:
Reinforcement Learning (RL)

RTM depends on hardware specification:
Number of learning table columns depends on the number of supported VFs

Platform	Num of VFs
Cortex_A7	13
Cortex_A15	19

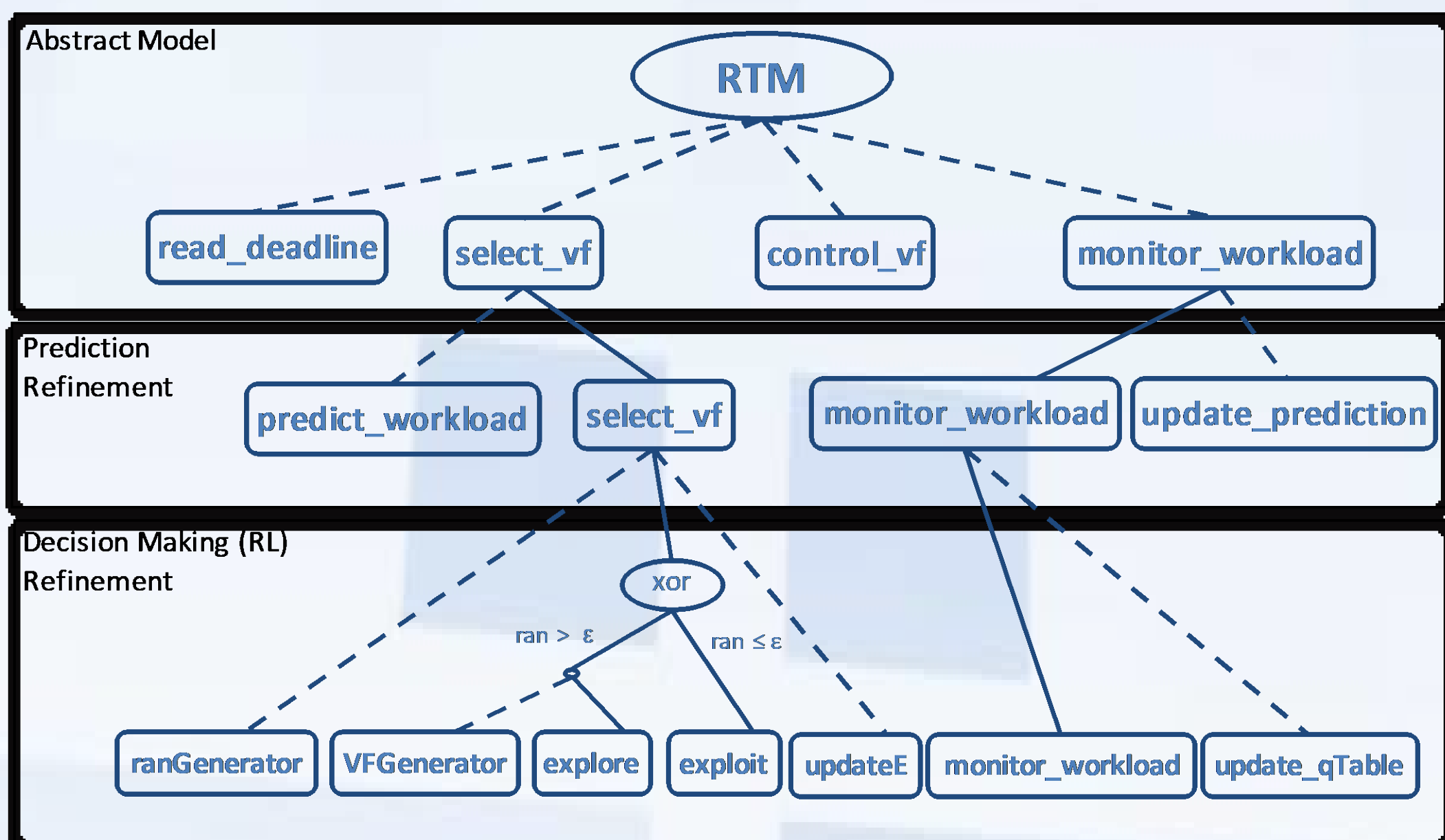
Platform diversity:
Platform-independent Event-B model
Automatically code generated RTM C implementation

The **tool** generates the implementation of the RTM algorithm **automatically**. The generated code **integrates with the PRiME framework**.

Exploration phase		ACTIONS (V-F pairs)				
		V1,F1	V2,F2	V3,F3	V4,F4	
STATES (Workload Amount)	0	0.0	0.0	0.0	0.0	
	1	0.0	0.0	0.0	0.0	
	2	0.0	0.0	0.0	0.0	
	3	0.0	0.0	0.0	0.0	
	4	0.0	0.0	0.0	0.0	

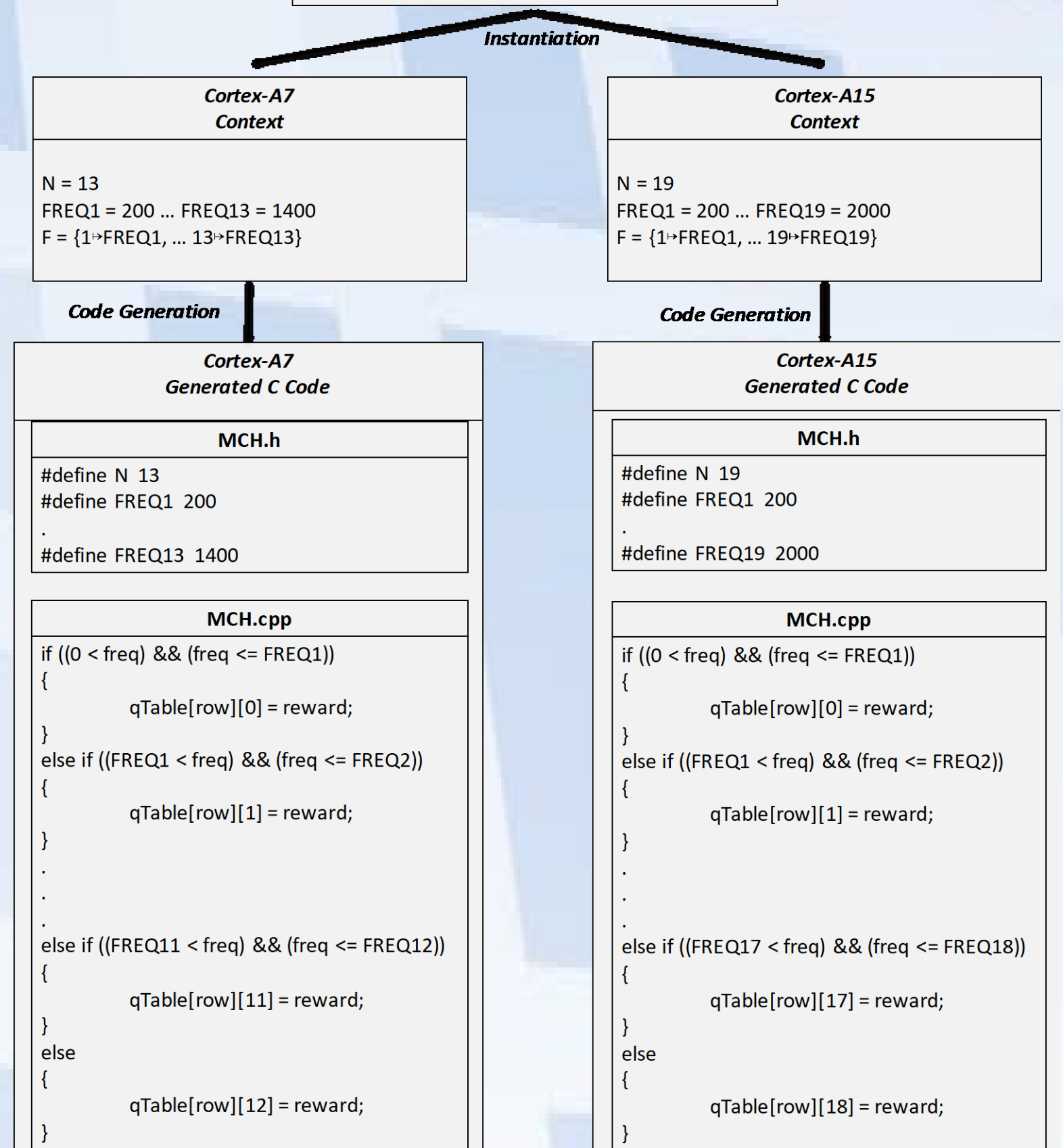
Several epochs later

Exploitation phase		ACTIONS (V-F pairs)				
		V1,F1	V2,F2	V3,F3	V4,F4	
STATES (Workload Amount)	0	0.8	0.2	0.2	0.1	
	1	-0.1	0.6	0.4	0.2	
	2	-0.4	-0.2	0.7	0.3	
	3	-0.7	-0.3	0.8	0.2	
	4	-1.0	-0.8	-0.1	0.8	



```

RTM Event-B action
update_qTable =
  ANY i
  WHERE
    i ∈ 1 .. N expanding
    F(i-1) < freq ≤ F(i)
  THEN
    qTable = updateArray( qTable, row, i, reward )
  
```



Automatic runtime integration testing of the PRiME framework

Testing that components interacting within the framework (applications, runtime algorithm and device) are satisfying the assumptions of the API:

- observing the behaviour of application, RTM and device at runtime
- checking the observed behaviour conforms to a given formal specification

Verifying the **correctness of interactions** (between application/device and runtime):

- Correct **API control flows**
- Correct **range of values** for a (application/device) control/monitor

