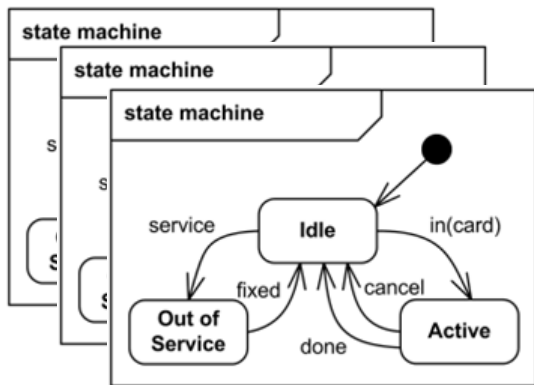


BEHAVIOURAL MODELS FOR DEVICE CONTROL

L. Andolfato, M. Comin, S. Feyrin, M. Kiekebusch, J. Knudstrup,
F. Pellegrin, D. Popovic, C. Rosenquist, R. Schmutzer

Library of Reusable Models



- Digitally controlled shutters
- Lamps with intensity control
- DC and stepper motors
- Multi-axis analog piezos



open source
MODELS

Exchanging Models

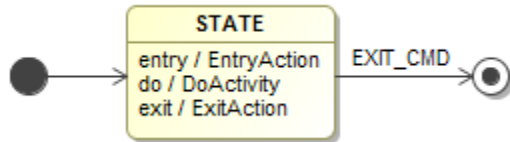
- 1) Language = Syntax + **Precise Semantic**
 - Avoid misunderstanding and enable Model Execution & Transformations

- 2) Models independent from specific technologies (**PIM**)
 - Facilitate reuse in other project/organizations

- 3) Exchange **format**
 - Tool independent (OMG XMI, EMF XMI, ...?)

Precise Semantics

“When **exiting a state**, the do-activity should terminate.”



Upon the EXIT_CMD event:

- | | | |
|----------------------|----|----------------------|
| 1) Stop DoActivity | or | 1) Invoke ExitAction |
| 2) Invoke ExitAction | | 2) Stop DoActivity |



Selecting a Modeling Language



OMG “Standard” but **without** (yet) a Precise Semantic for the State Machine.

Partial Syntax definition,



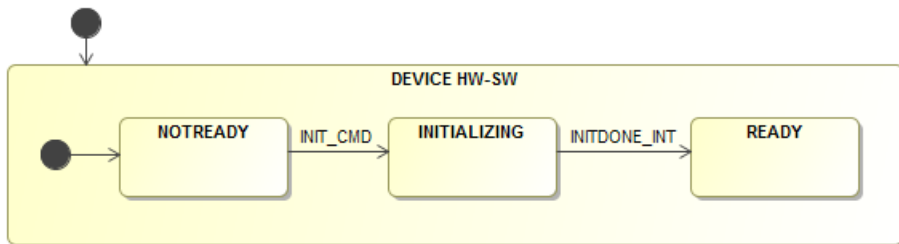
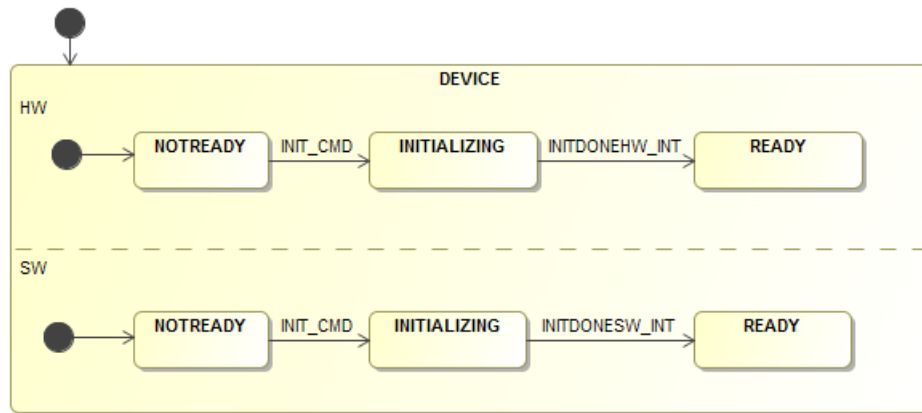
no Semantic specification.

W3C recommendation **with** Precise Syntax and Semantic.
XML textual format **easy** to exchange.
(**Interpreted** Statecharts.)



Architectural Principles: State Semantic

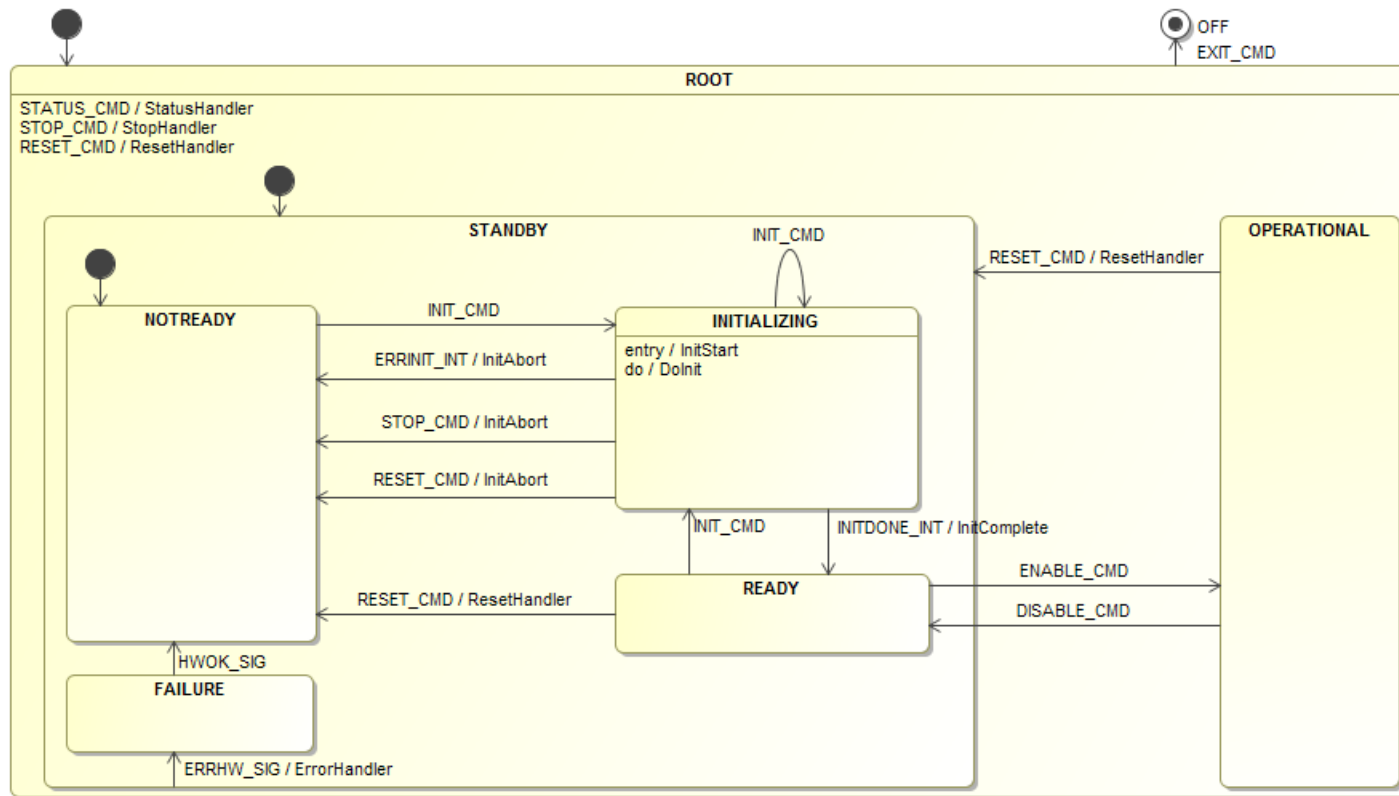
HW and SW have dedicated States on different orthogonal regions.



States represent “HW and SW together” with priority given to HW.



ES Architectural Principles: General & Specialized Behavior



Specialize Composite States ✓

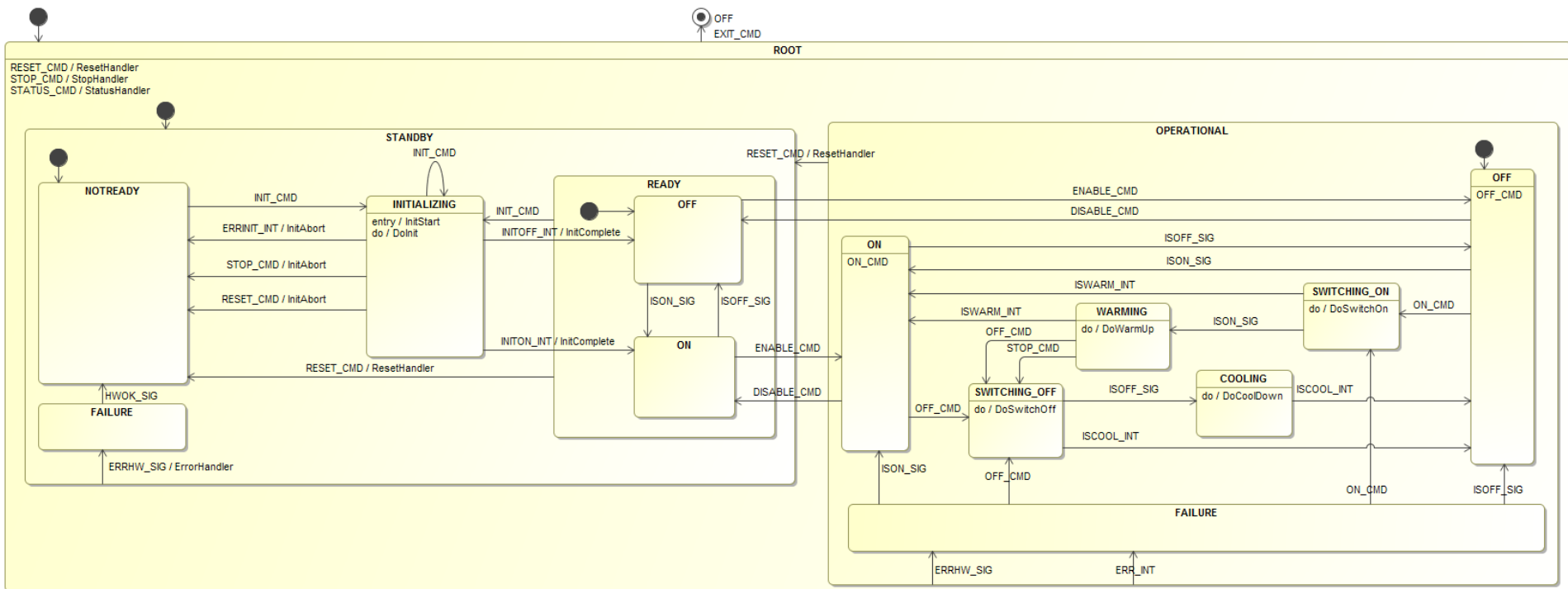
Vs

Dedicated Orthogonal Regions

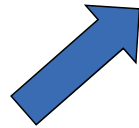
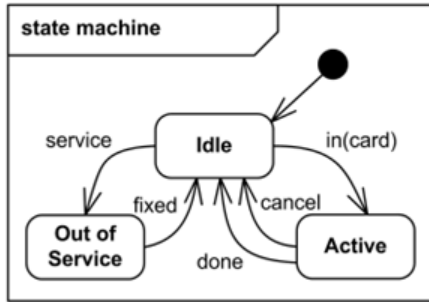


Phase	Goal	Failure Effect
Startup / Initialization	Increase System Reliability	Triggers system re-initialization.
Operation	Increase System Availability	Allows for retries (does not force a re-initialization).

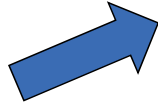
Lamp Device



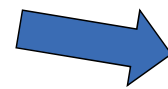
Using the Models



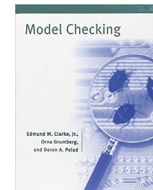
Design Document



Execute the Model



Transform into Code and Simulators



Formal Verification



Where to get our models? Open-MBEE

GitHub repository page for **Open-MBEE / Comodo**. The repository name is highlighted with a red box. The breadcrumb path **Comodo / Models / Devices /** is also highlighted with a red box. The commit history shows a commit by **landolfa** on GitHub with the message "Added shutter, lamp, motor, piezo models." and a list of files: **EMF-XMI**, **MagicDraw**, and **SCXML**, all added 10 days ago.

<https://github.com/Open-MBEE/Comodo/tree/master/Models>

Questions?



MODELS RE-USE