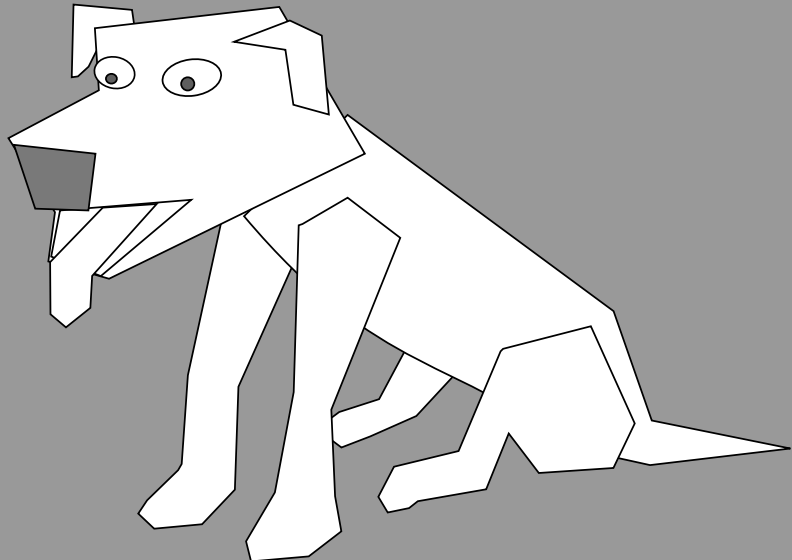
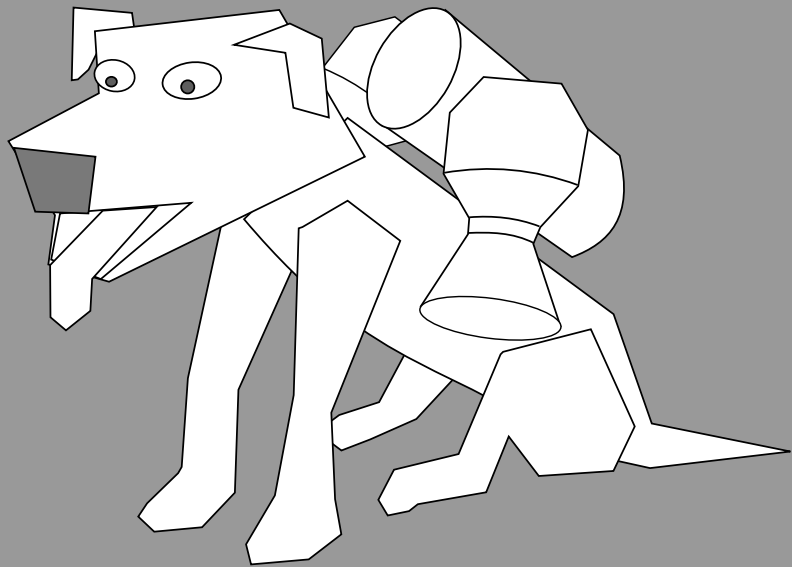


An Open Source Tool for Performing Coupled OpenModelica - FPGA Simulations

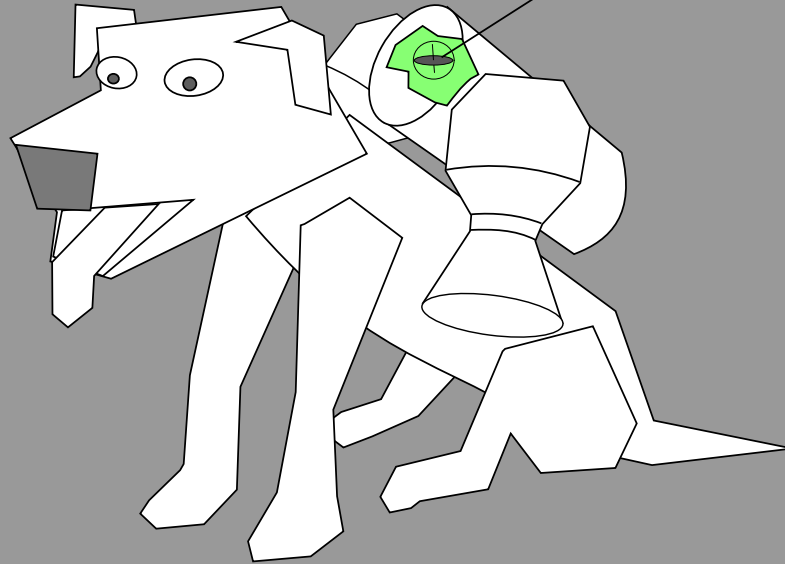
Adam Lange
Engineering contractor
Lange Turbo

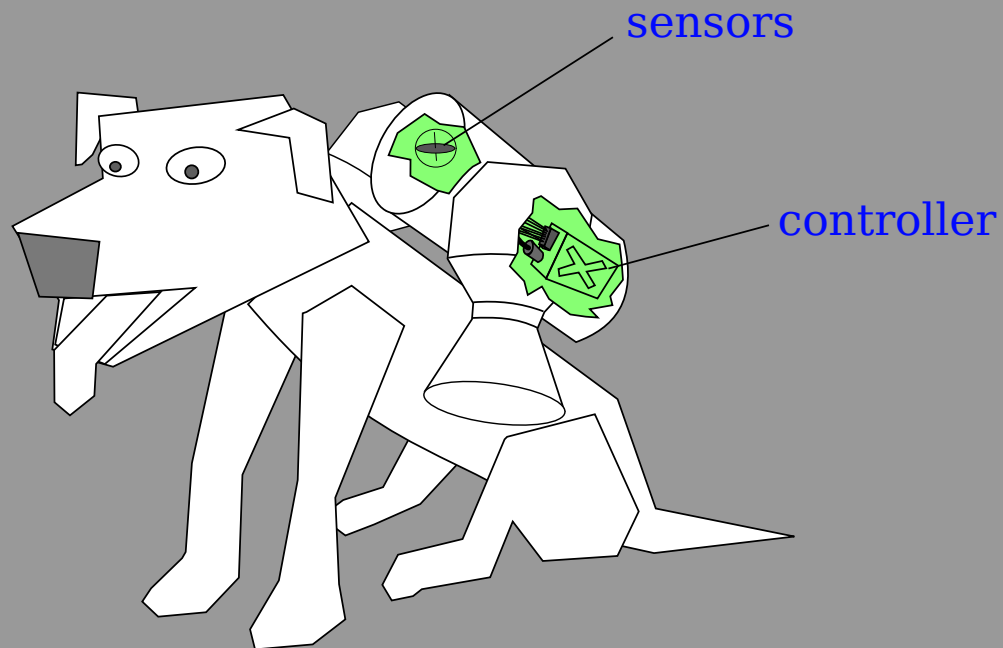
adam.lange@langeturbo.com

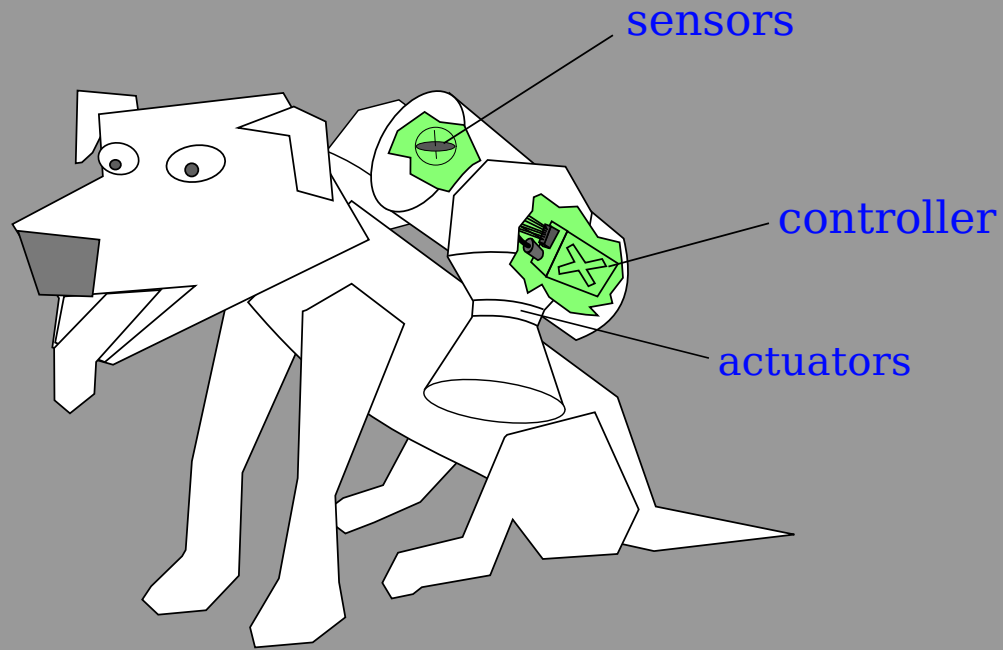


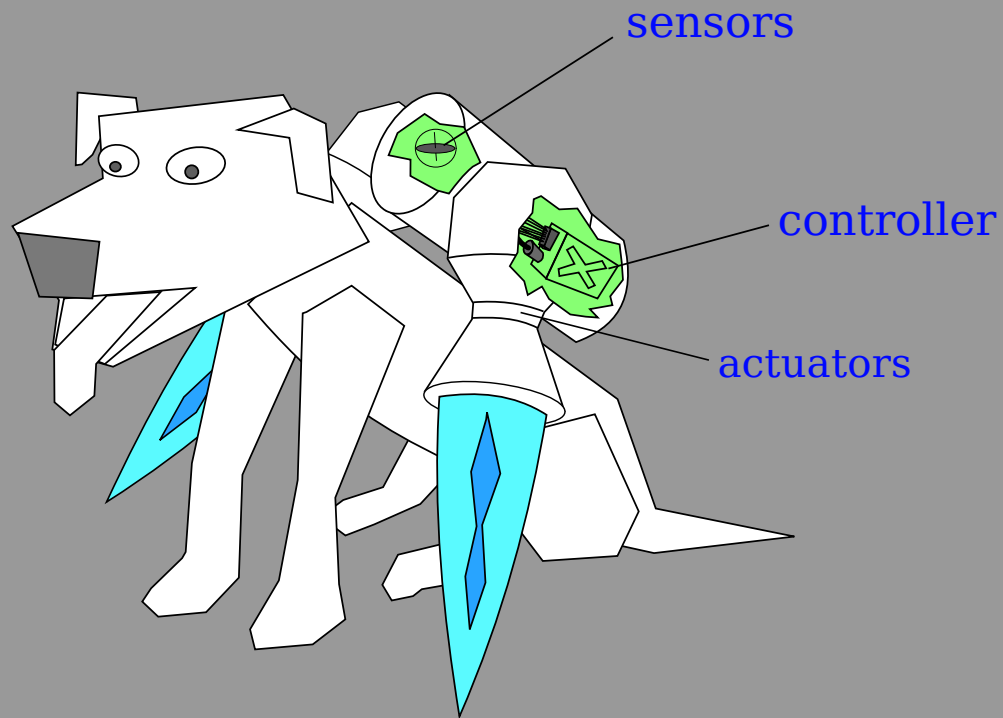


sensors

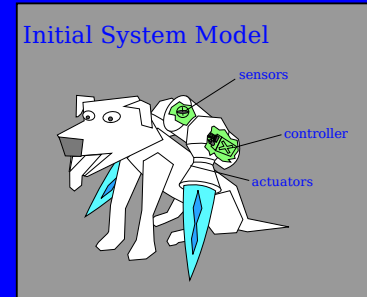








OpenModelica



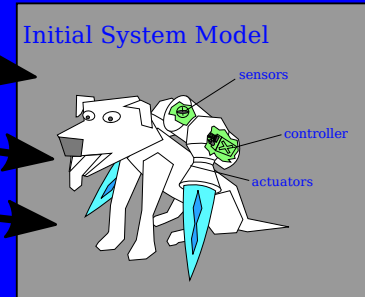
Step 1: System design and feasibility study

Creativity

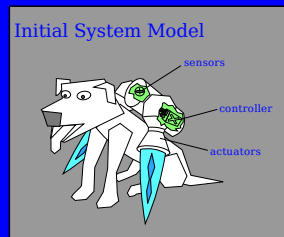
Equations

Design iterations

OpenModelica

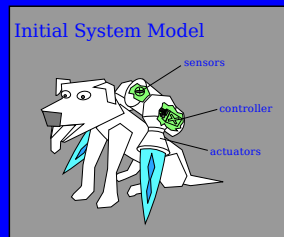


OpenModelica



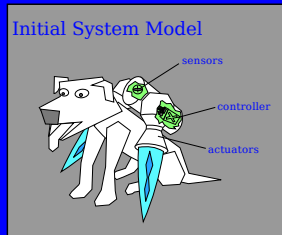
Physical Prototype

OpenModelica

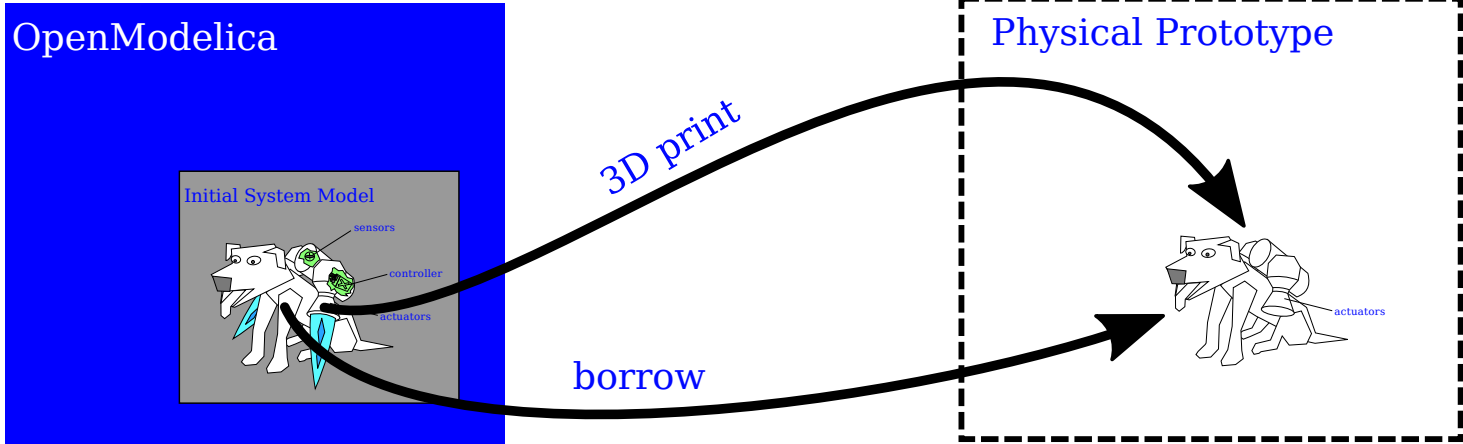


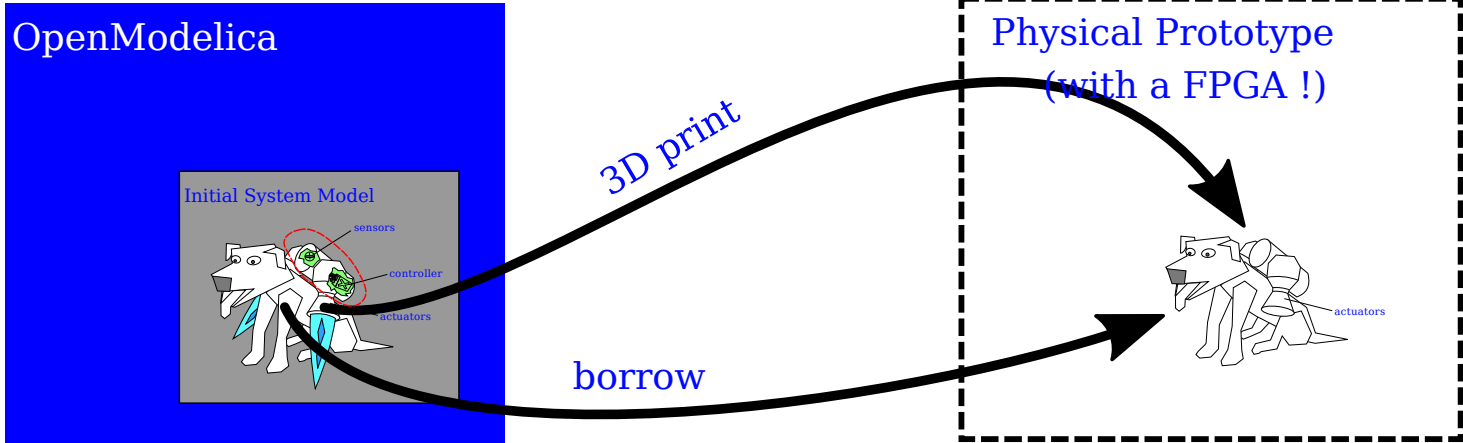
Physical Prototype
(with a FPGA !)

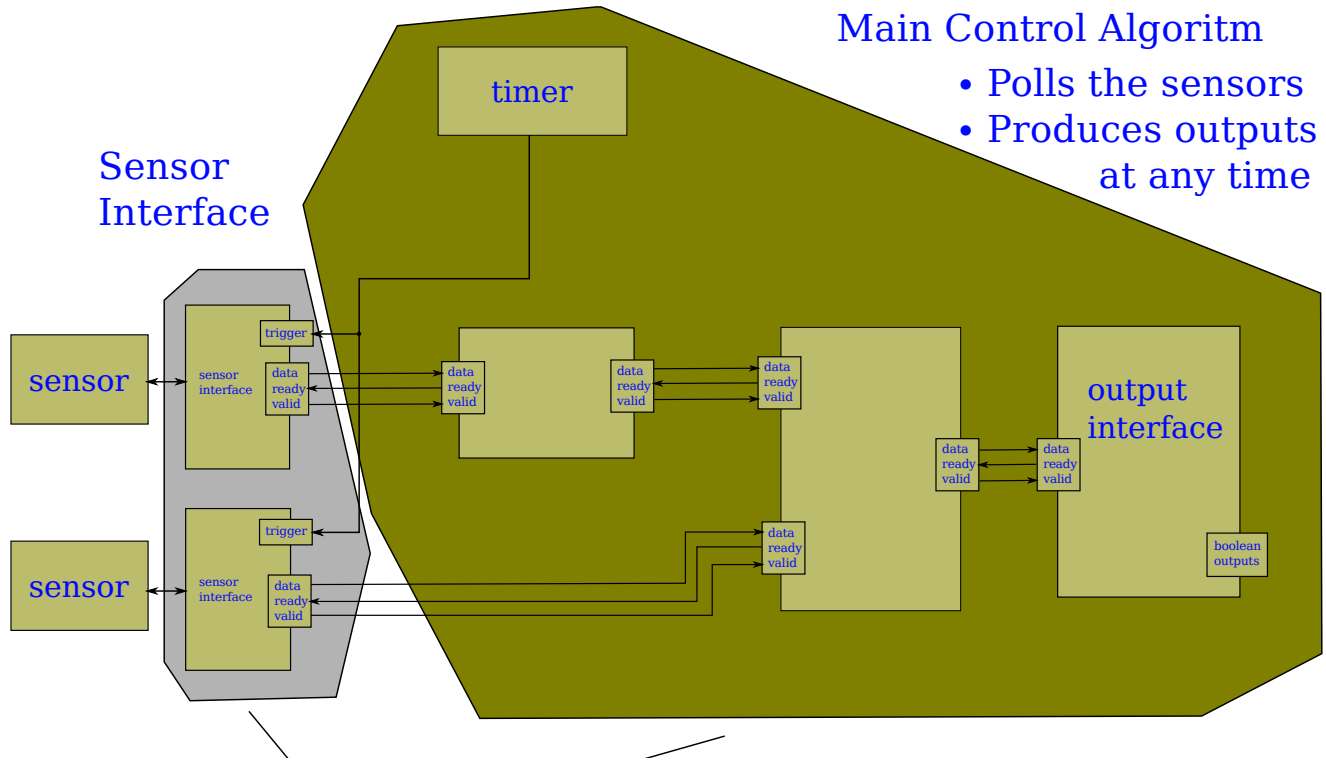
OpenModelica

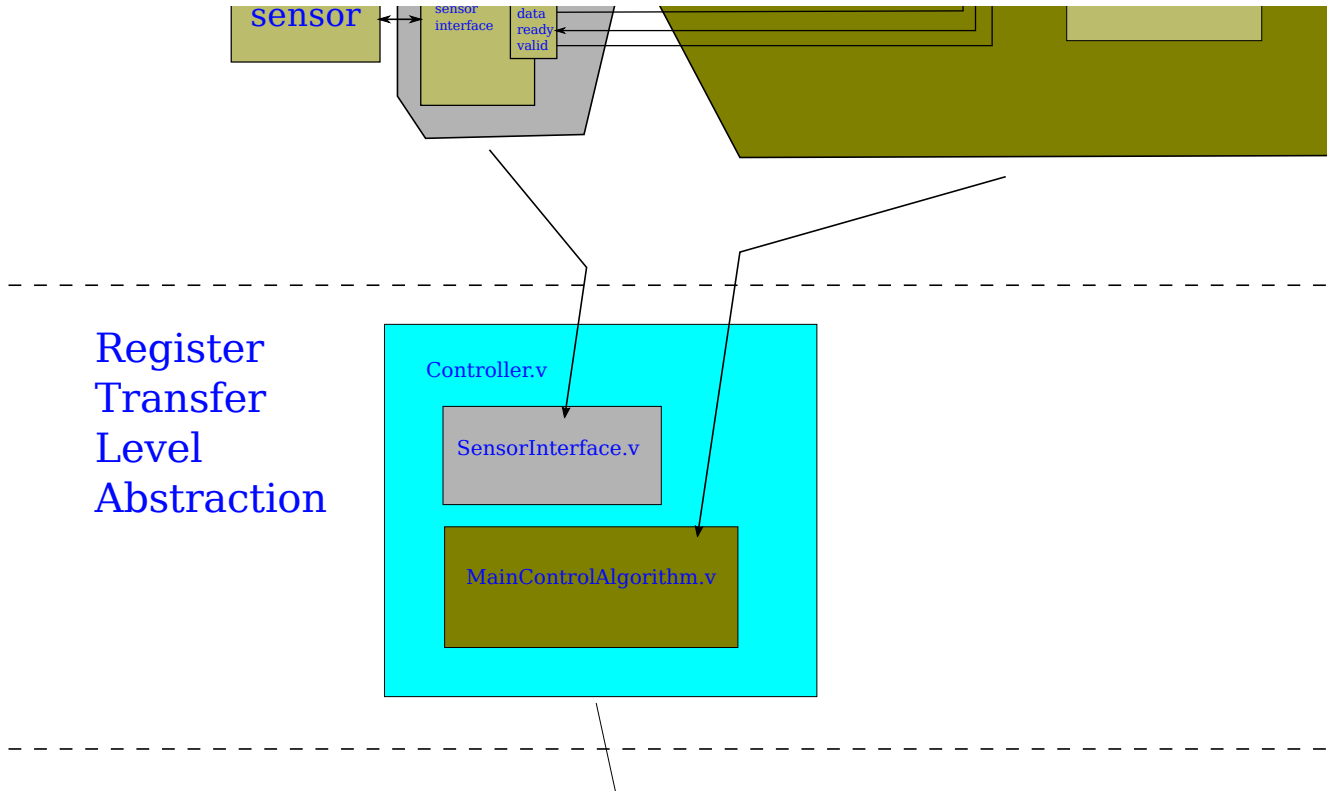


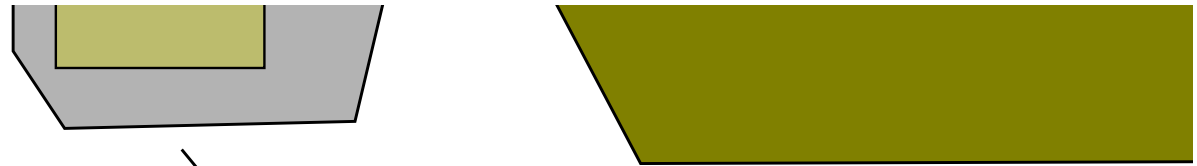
Physical Prototype



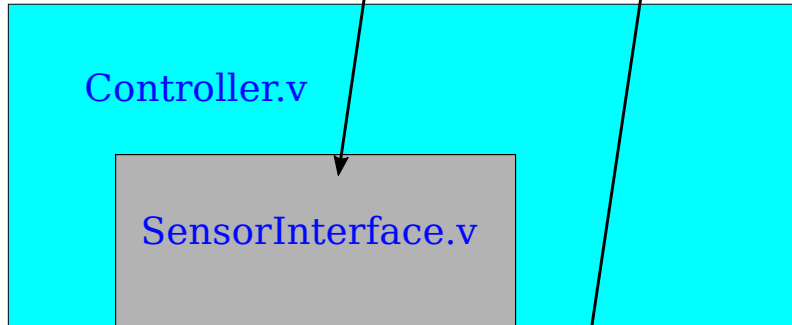


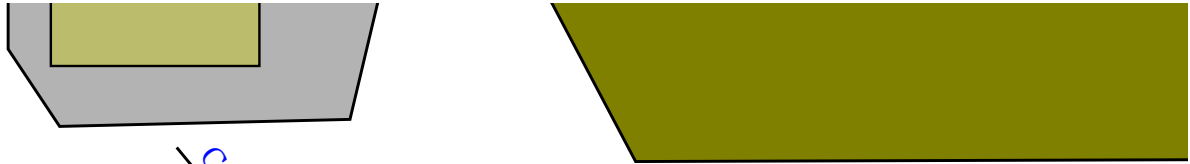






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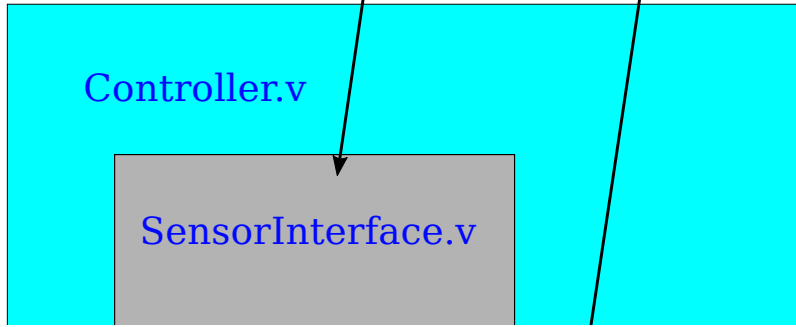


C-to-verilog
High Level
Synthesis

C-to-verilog
High Level
Synthesis

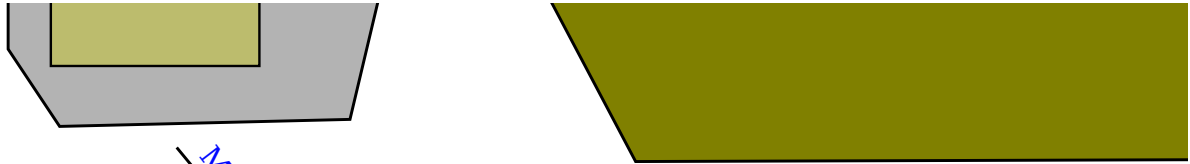


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Controller.v

SensorInterface.v

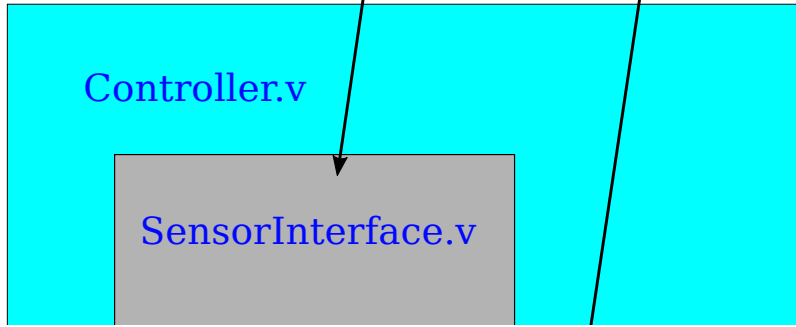


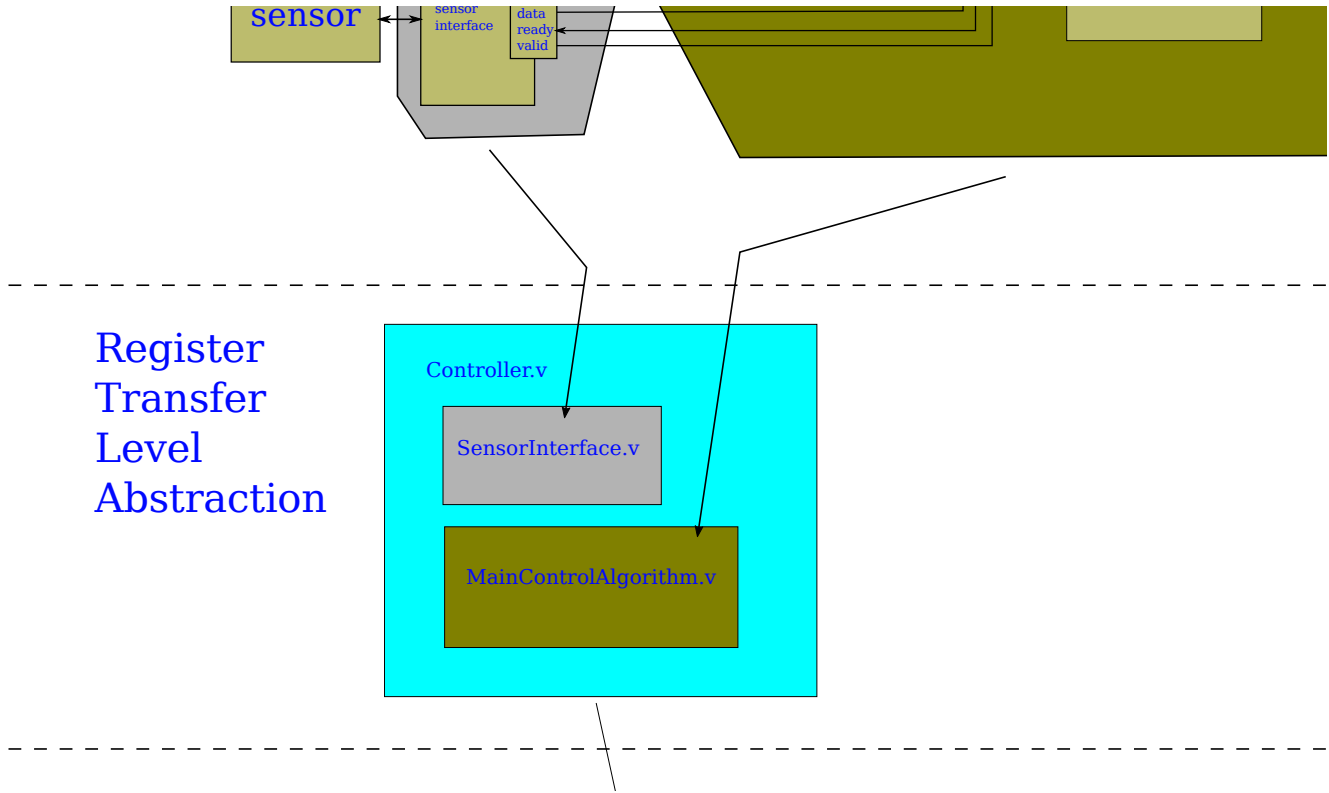
Modelica-to-RTL
High Level
Synthesis??

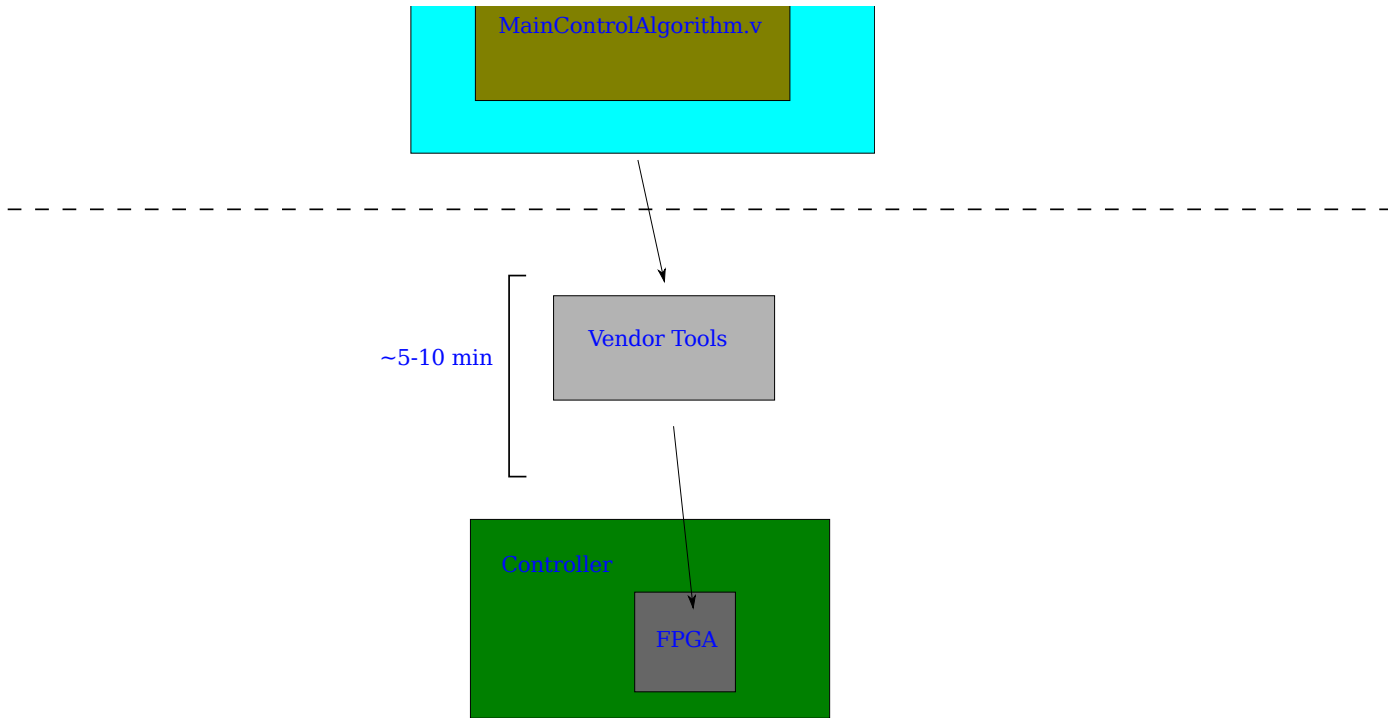
Modelica-to-RTL
High Level
Synthesis??

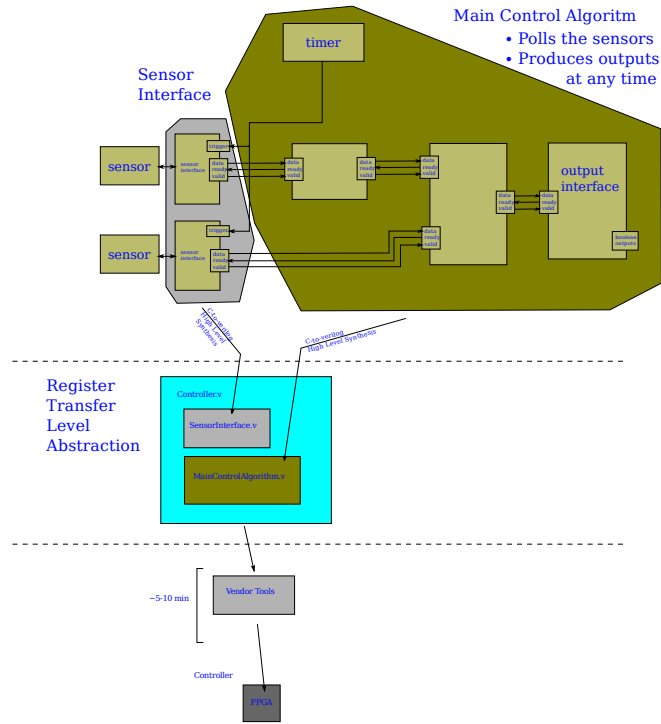


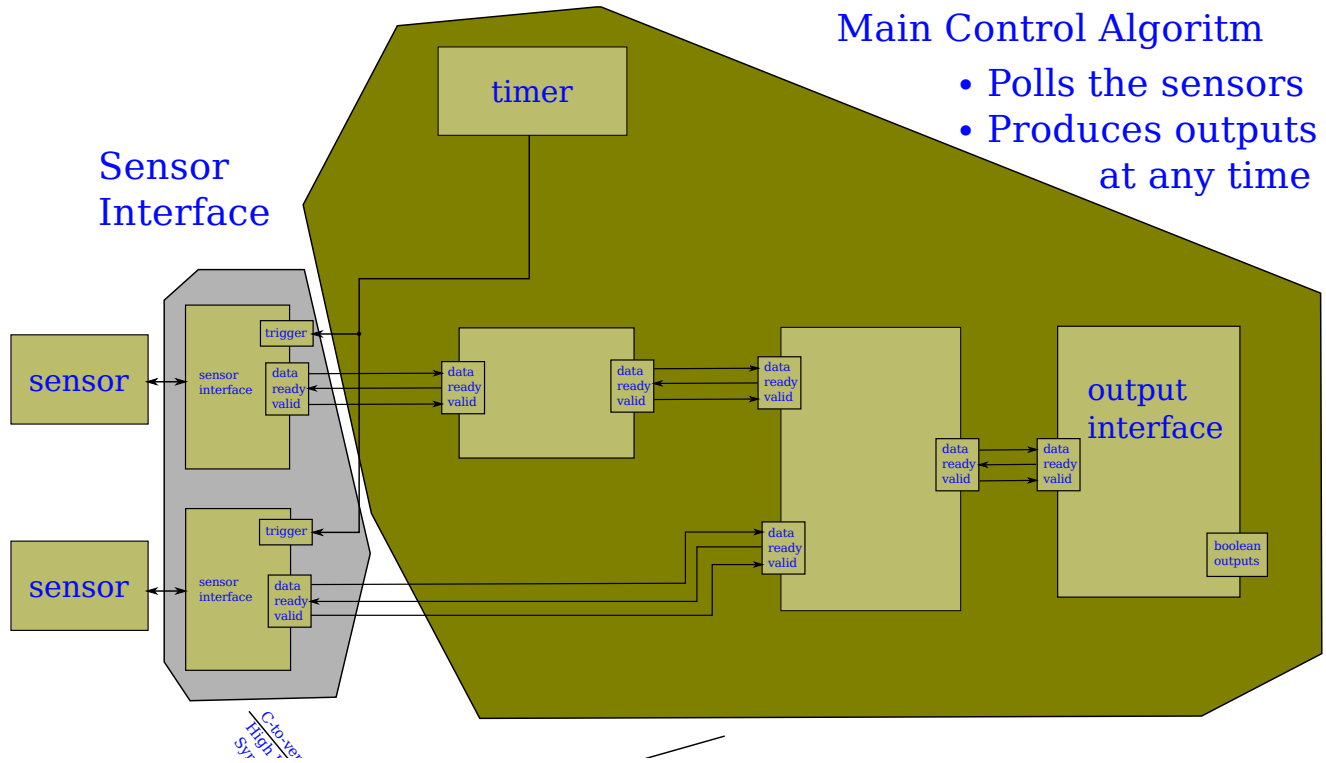
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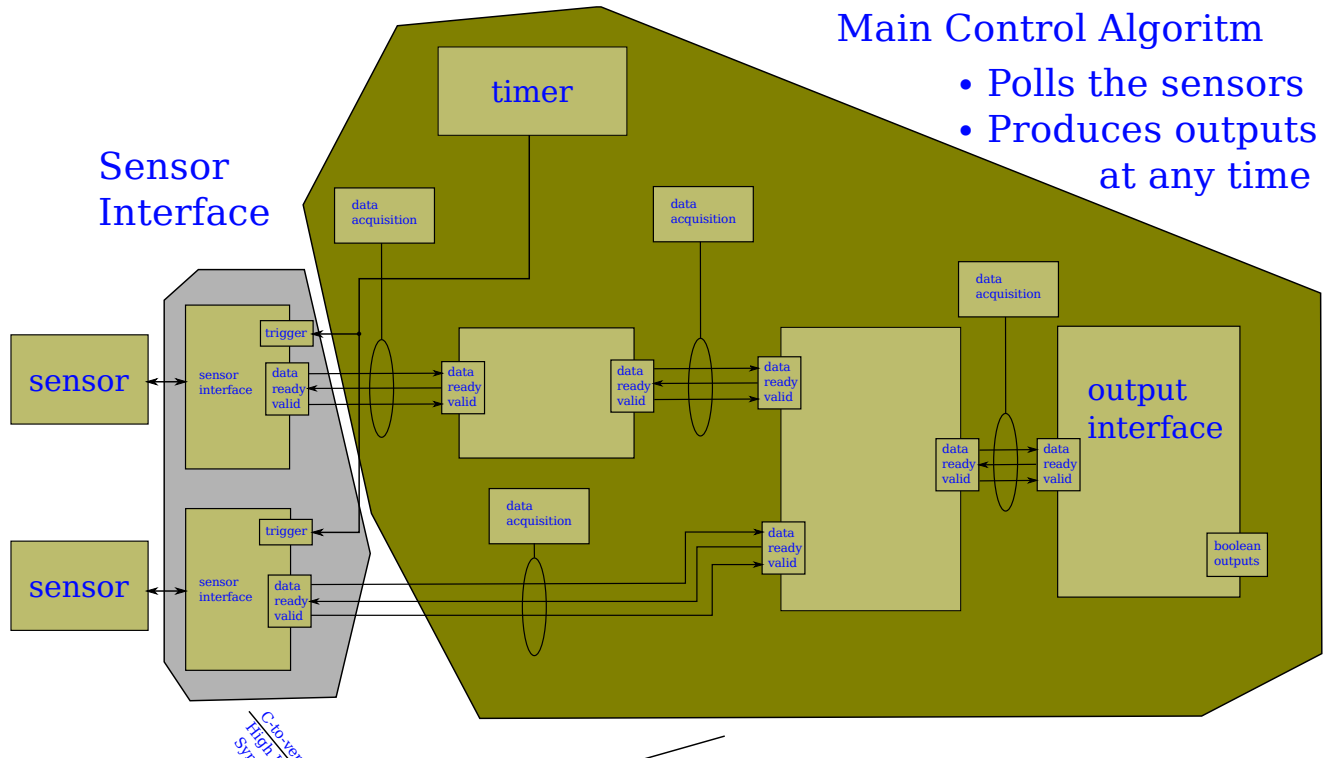


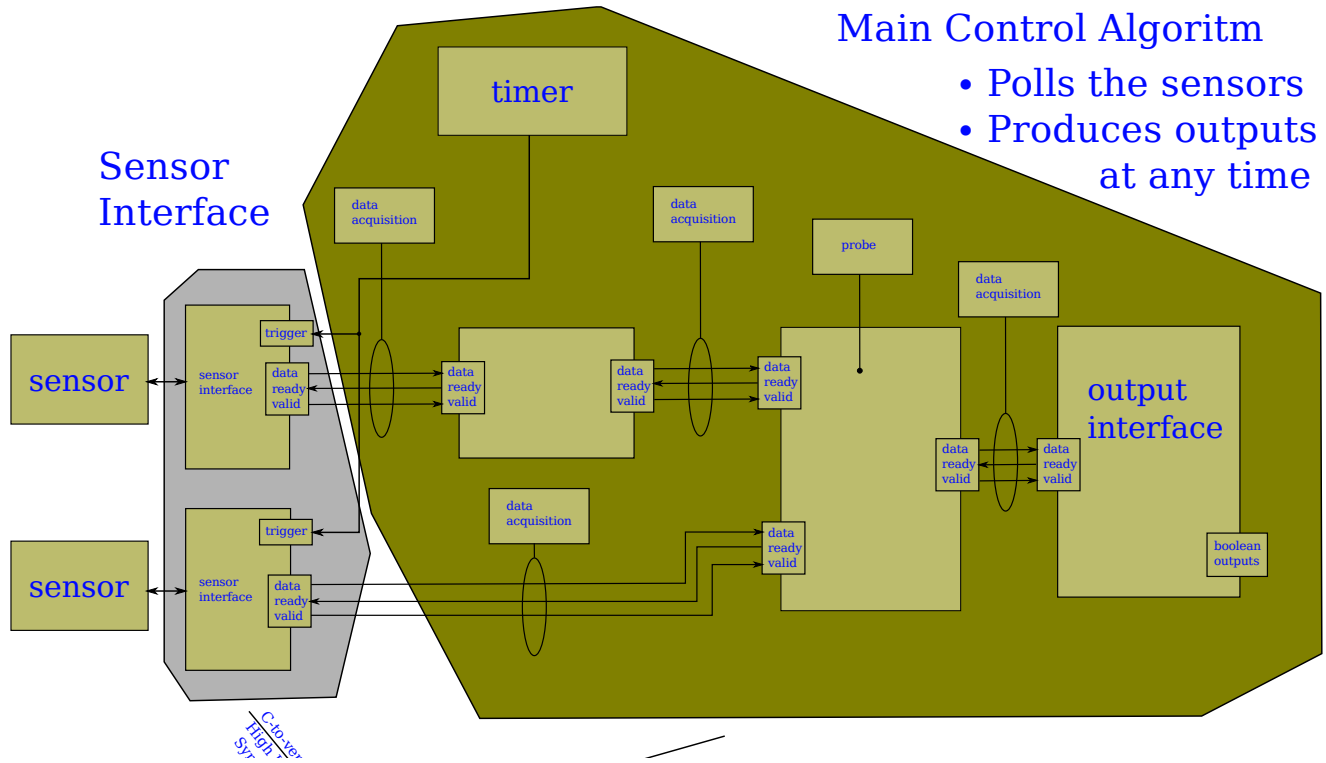


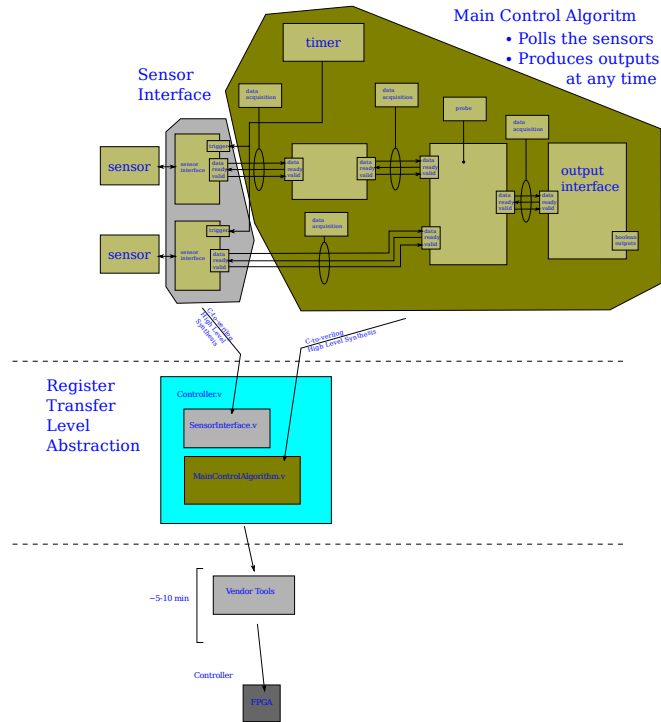


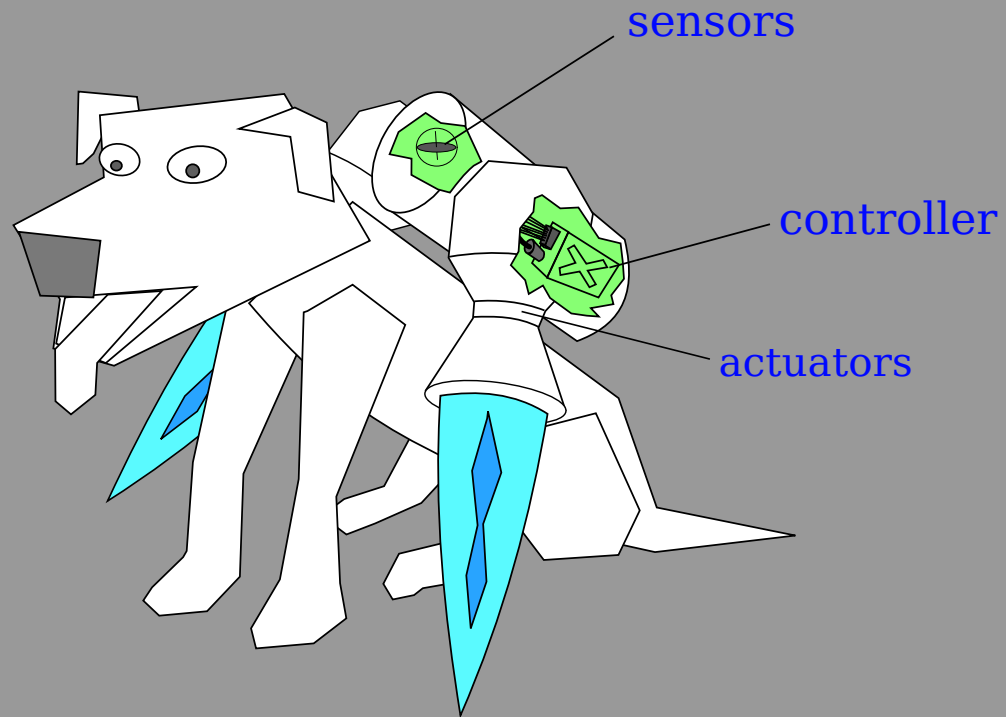
Main Control Algorithm

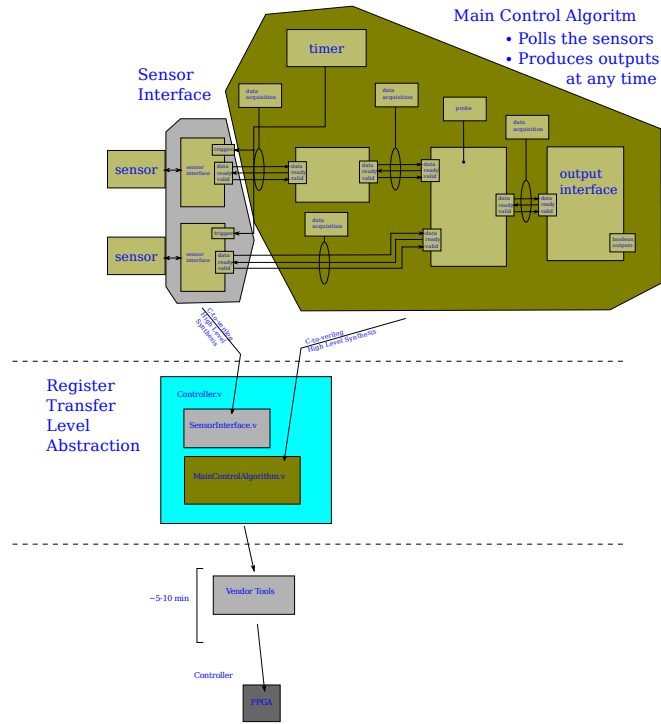
- Polls the sensors
- Produces outputs at any time

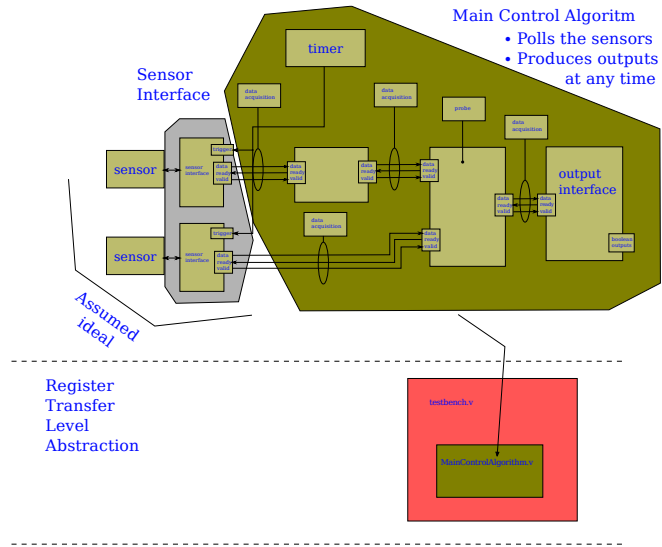


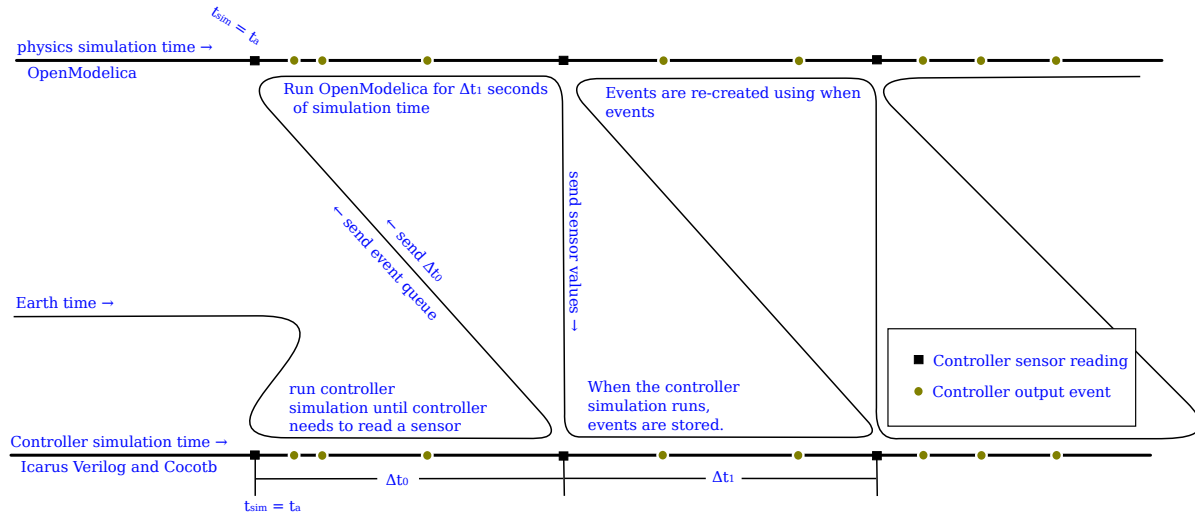


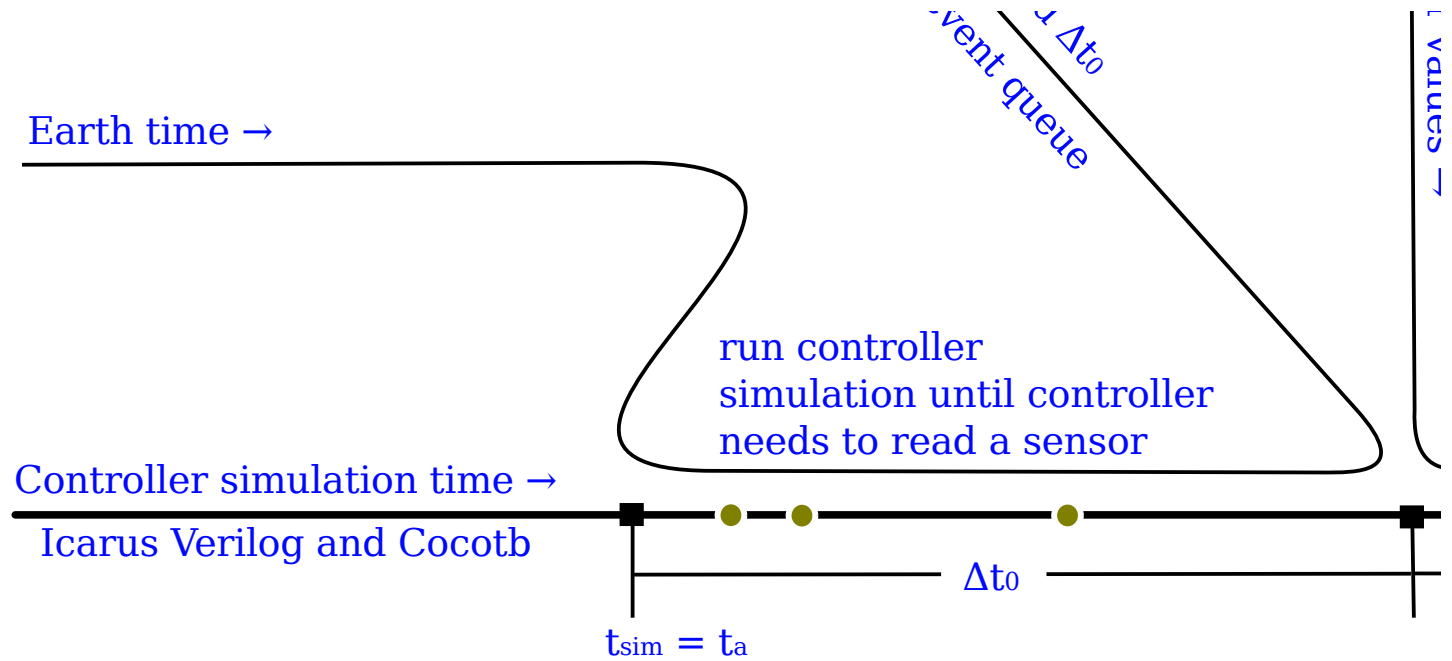


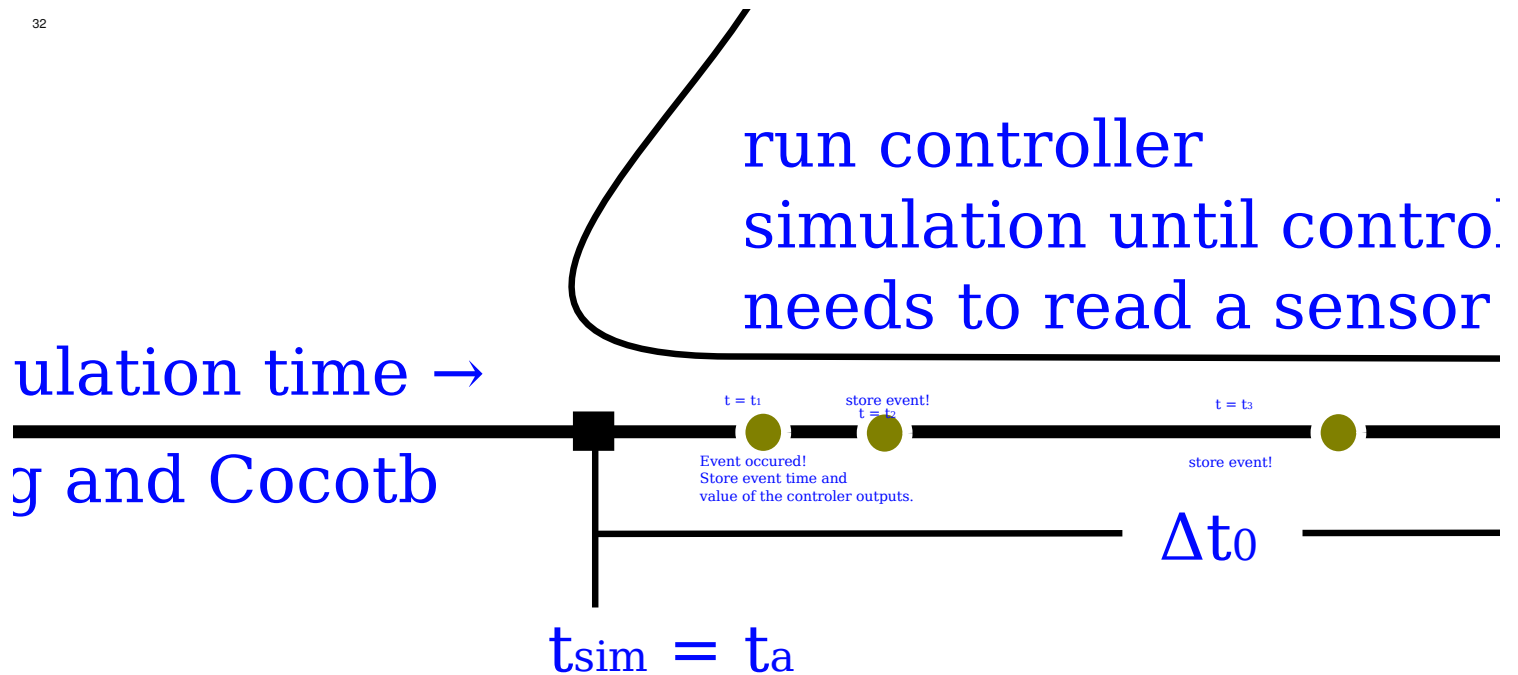


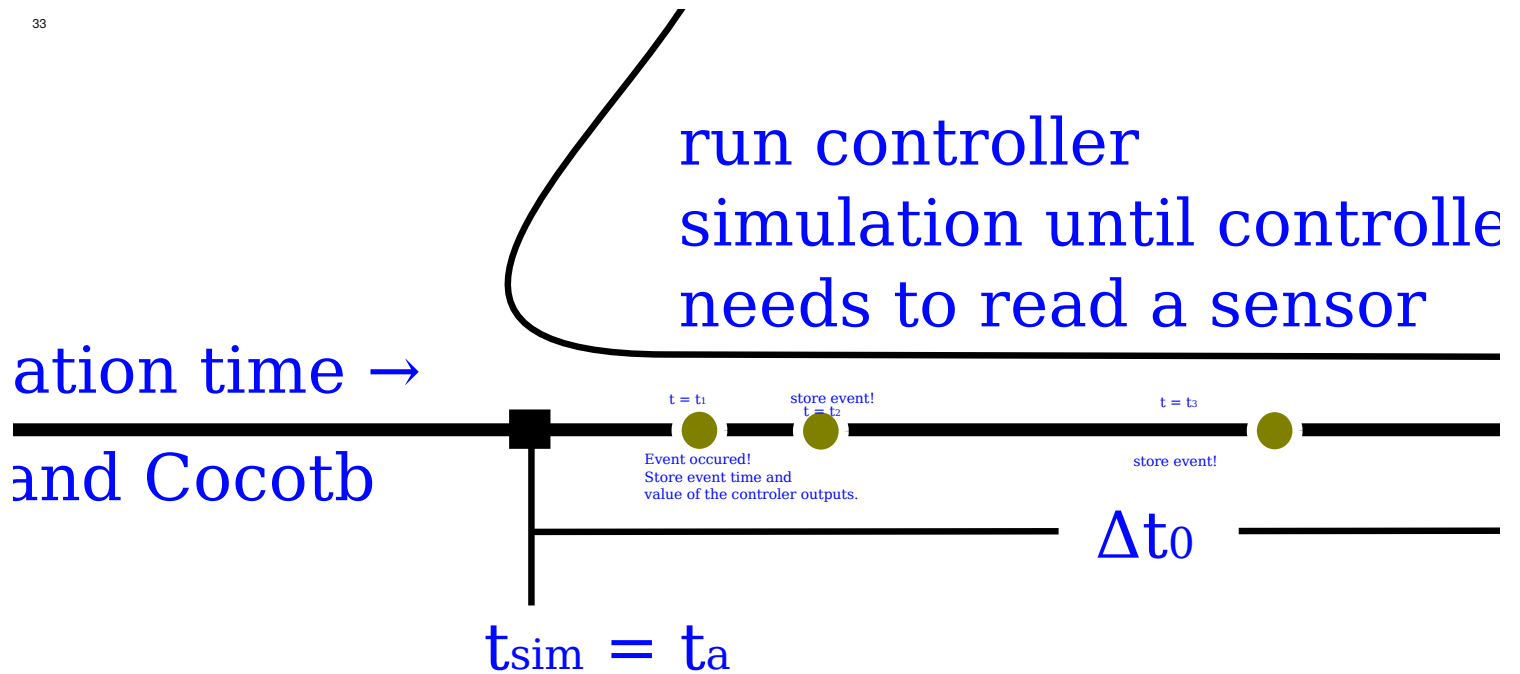




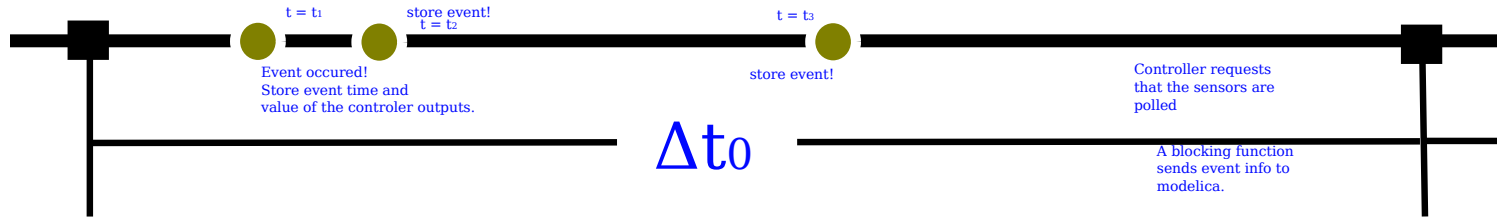








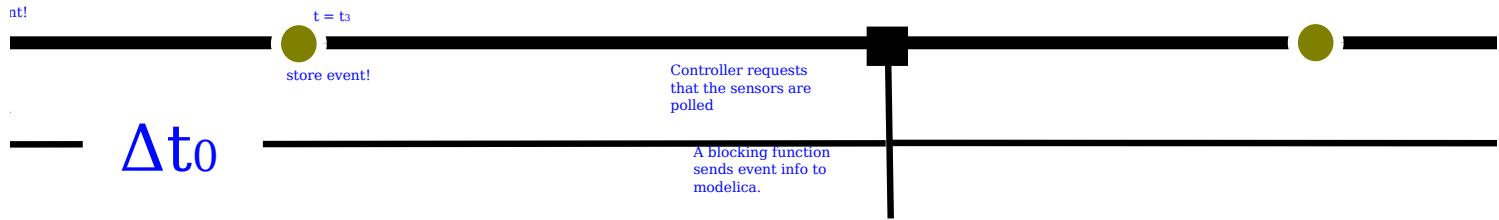
run controller
simulation until controller
needs to read a sensor

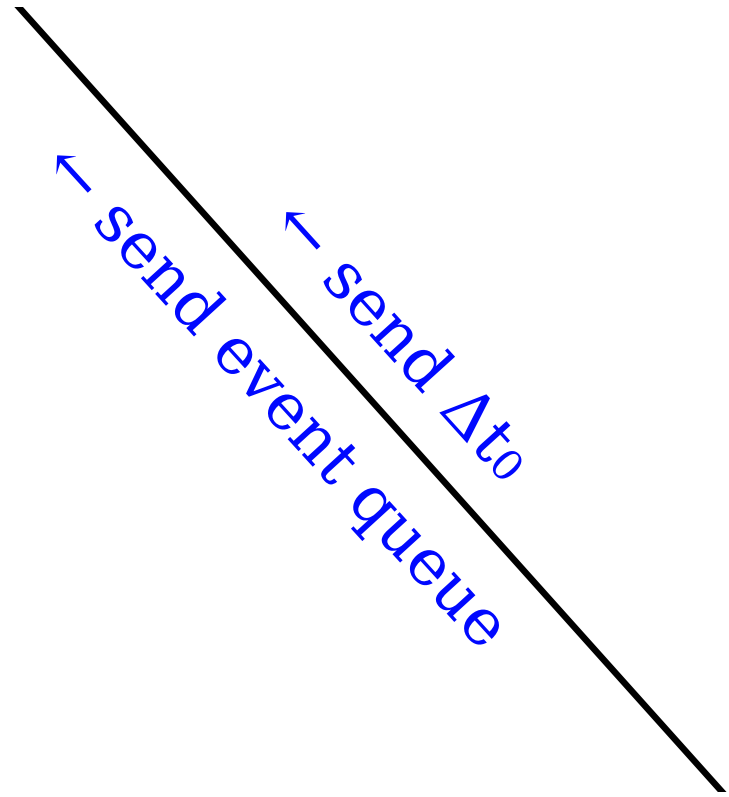
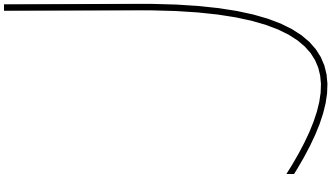


$$t_{\text{sim}} = t_a$$

Controller
 runs until controller
 reads a sensor

When the controller
 simulation runs
 events are stored





$n = t_a$

Modelica when event
is triggered at $t = t_1$
and controller output
values are set

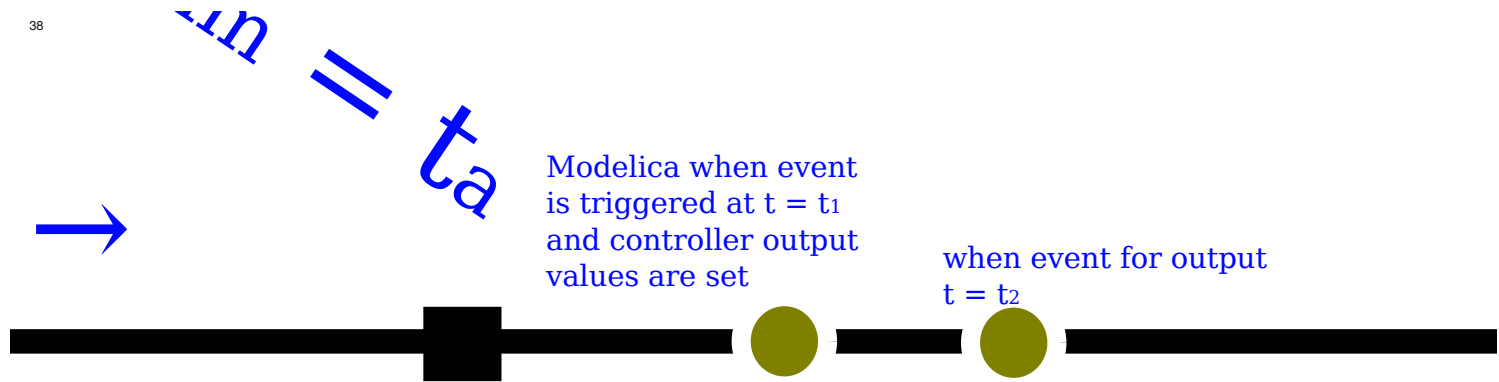
when event for output
 $t = t_2$

when event for output
 $t = t_3$

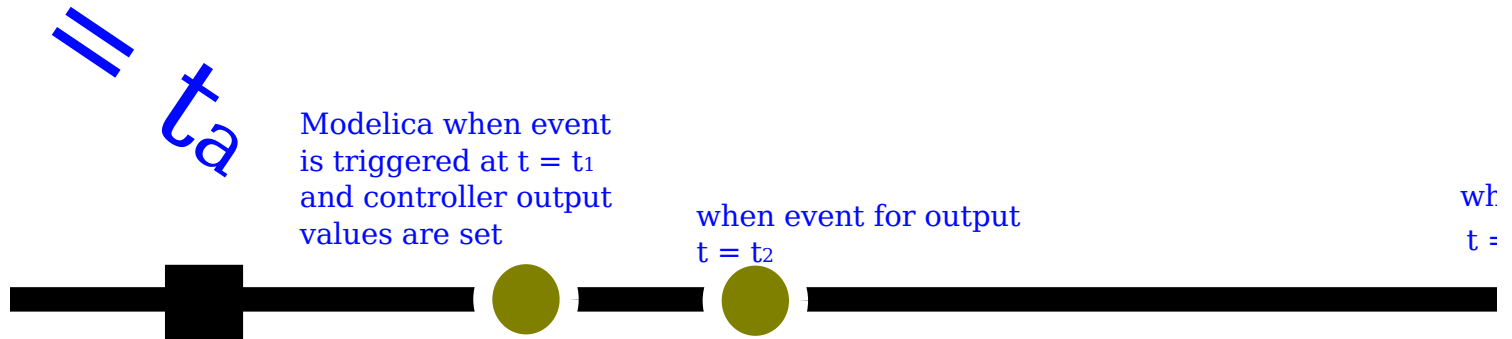
when event triggers
an impure function call
at Δt_1 , where controller
requested to poll sensors

modeli
by the

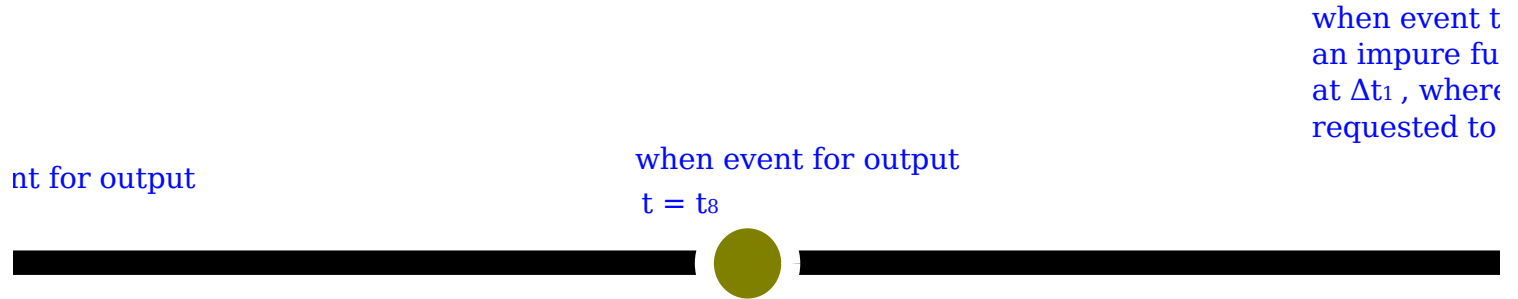
Run OpenModelica for Δt_1 seconds
of simulation time



Run OpenMc
of simulatio



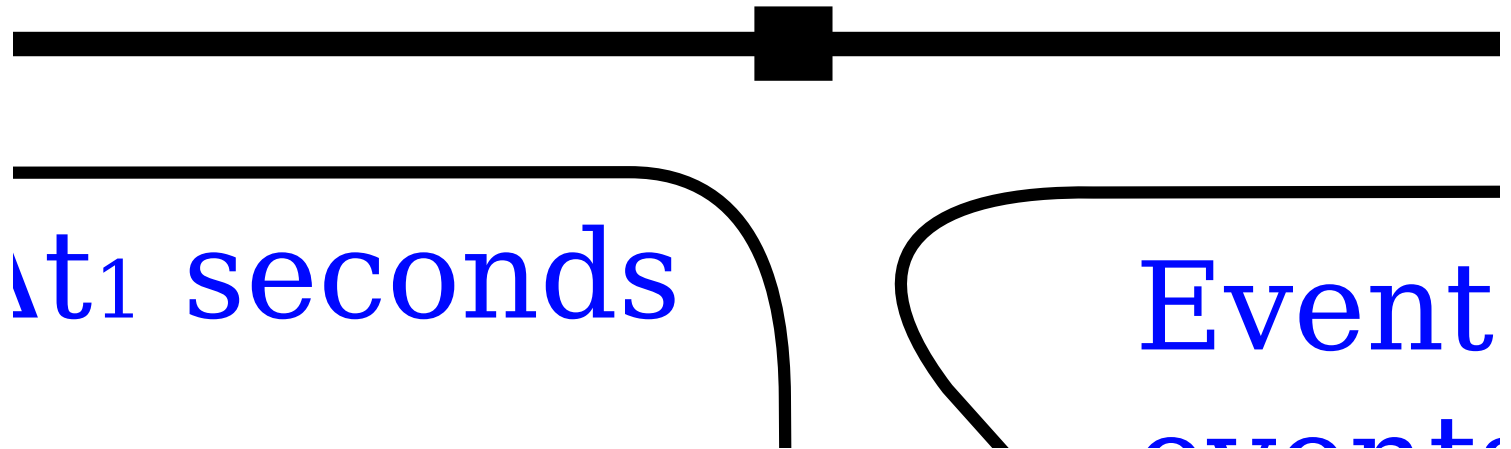
Run OpenModelica
of simulation tir

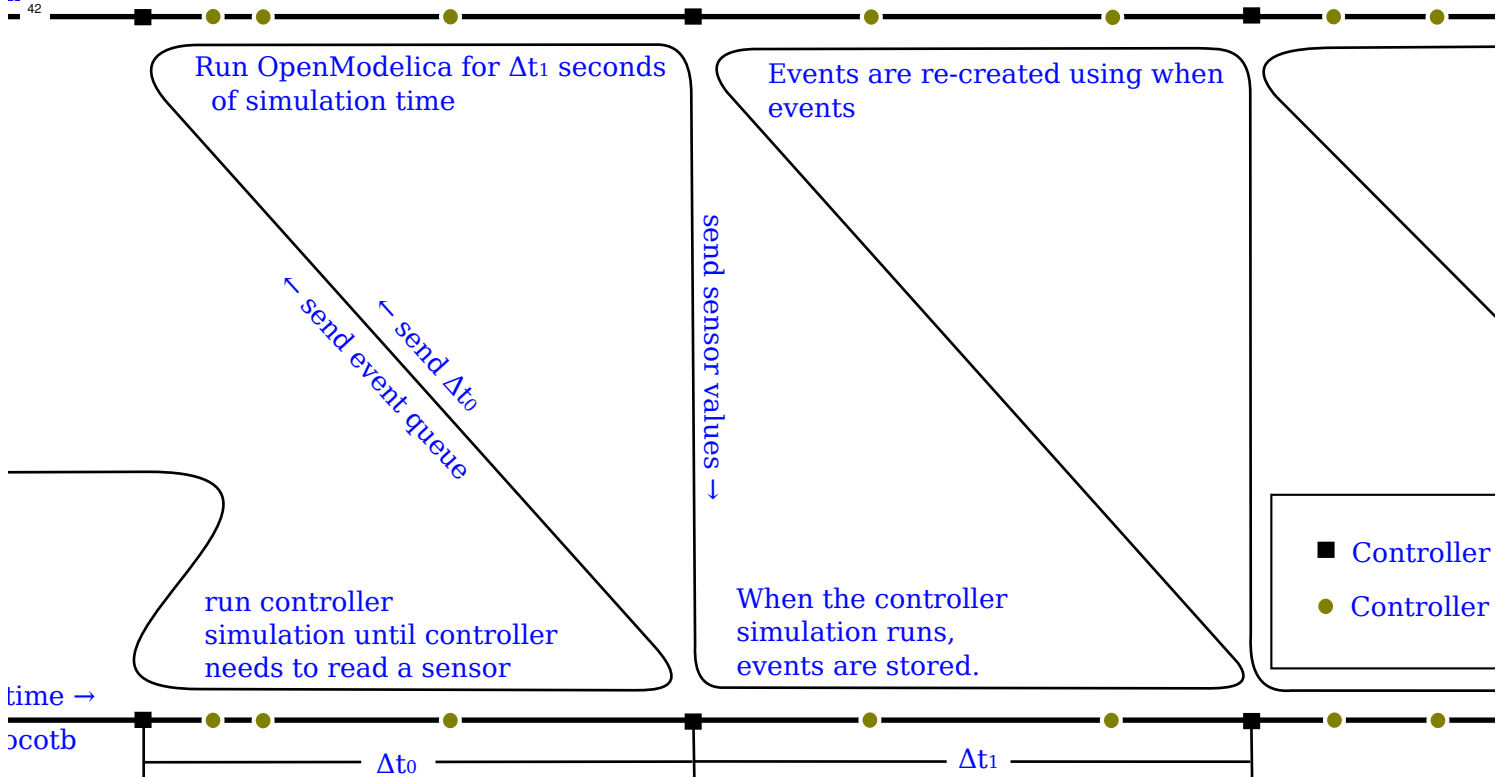


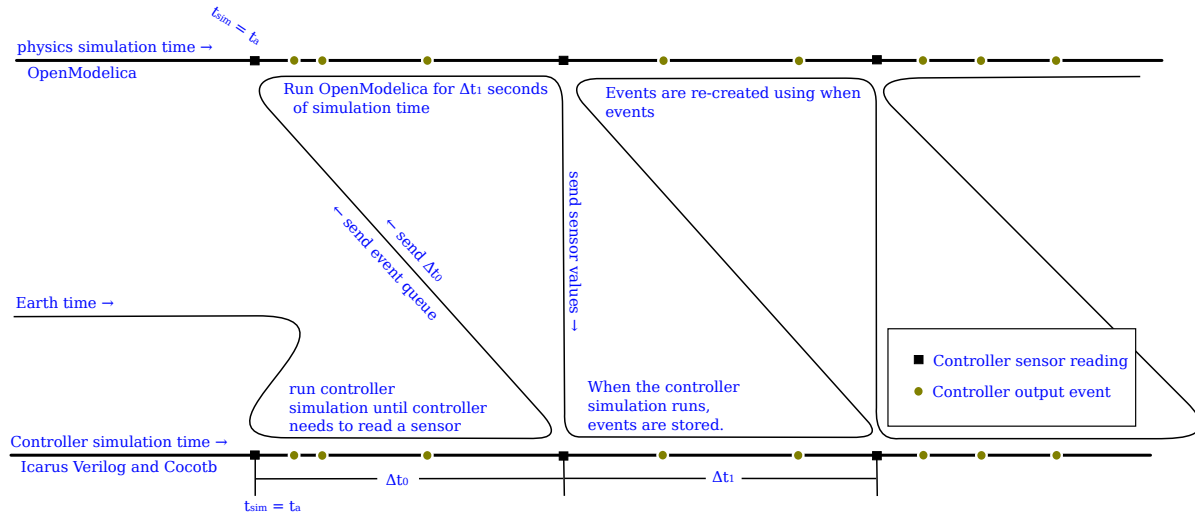
openModelica for Δt_1 second
 simulation time

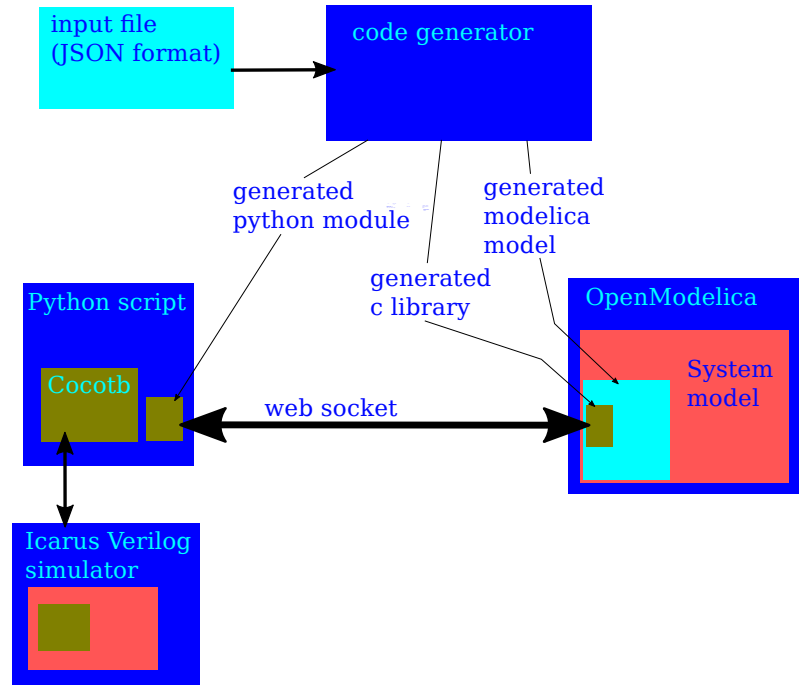
when event triggers
an impure function call
at Δt_1 , where controller
requested to poll sensors

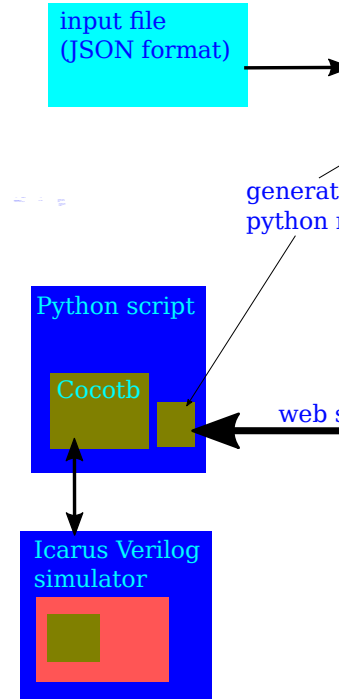
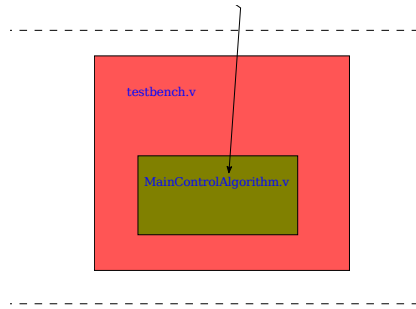
modelica execution is blocked
by the function











<https://github.com/adamLange/hdlModelicaInterfaceGen>