Facilities for Testing Control Software

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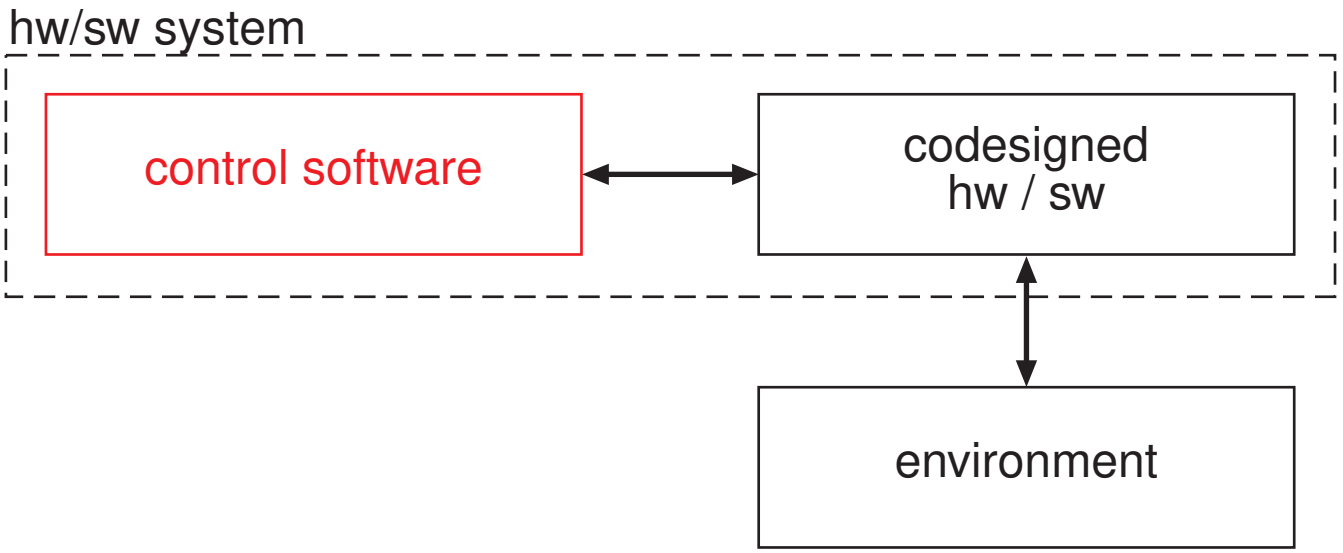
Overview

- What is control software?
- What is the problem?
- The architecture
- The testing architecture
- Design for test
- Implementation
- Application
- Conclusion

Control Software



control software is

- high-level
- no stream / data processing
- developed independent of codesign process

Problem Statement

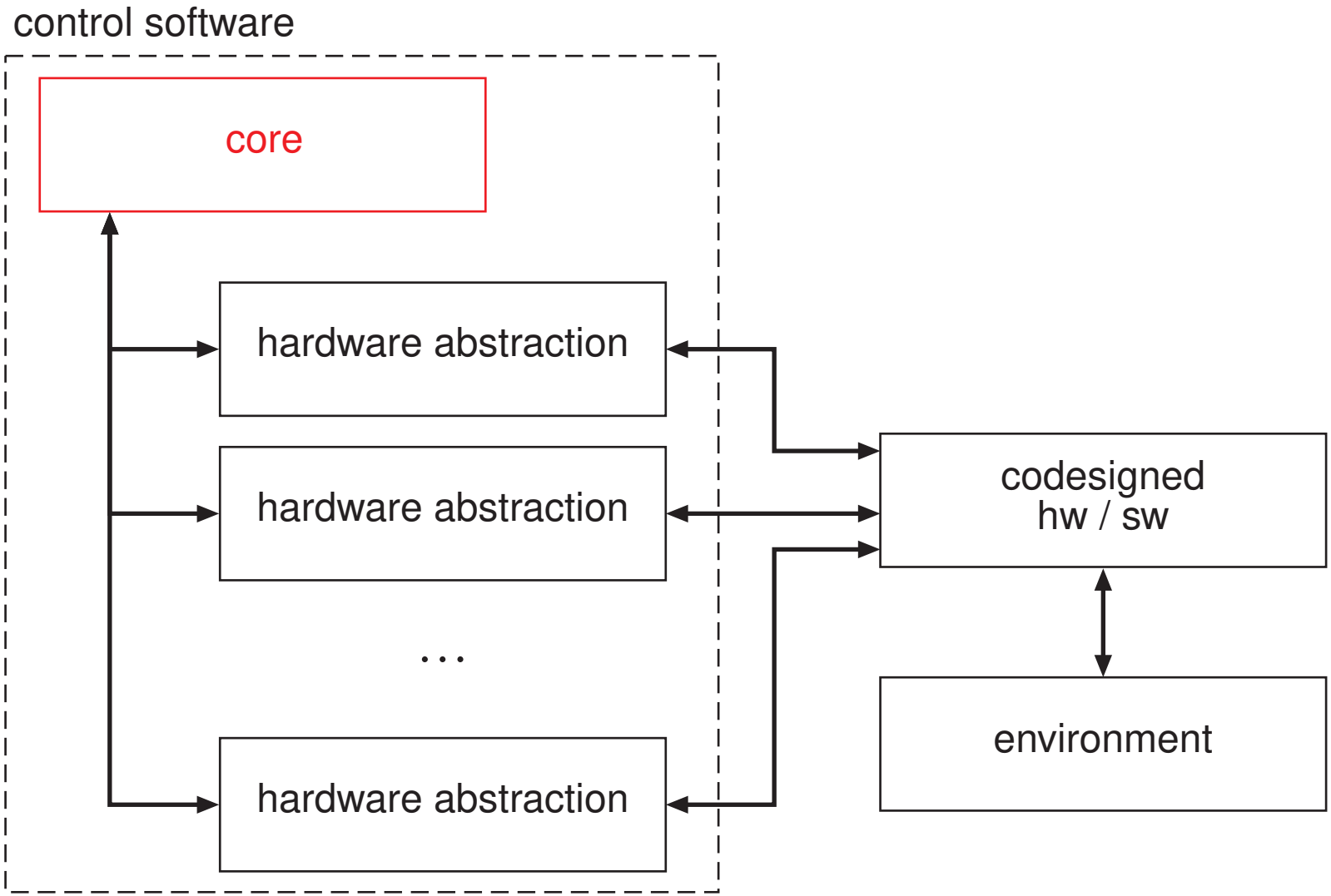
How to test control software?

- at (sub-) system level
- prior to hardware availability
- unattended
  - independent of hardware / availability

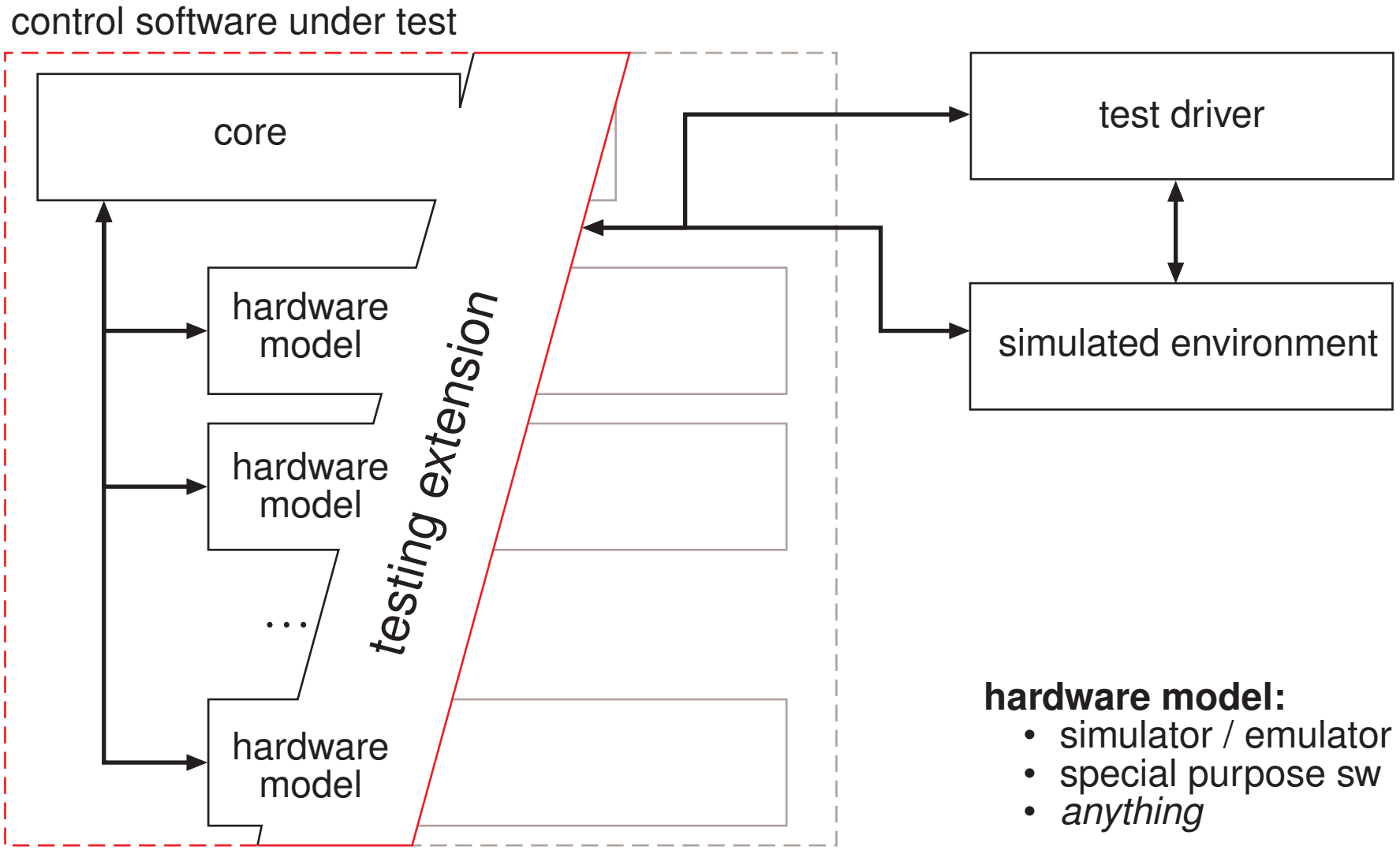
Generalizing

- how to test software that interacts with hardware
  - independent of hardware
  - unattended
- convert control software into ‘normal’ software
  - normal testing methods apply
  - normal tools can be used

The Architecture



The Testing Architecture



hardware model:

- simulator / emulator
- special purpose sw
- *anything*

Design for Test

Hardware

- test: the design
  a particular instance
- testing facilities: part of design

Software

- test: the design
- testing facilities: *not* part of design

Implementation

premise: object oriented programming language

mechanism: ability to amend objects' behavior

- modify / add behavior
  - replace / add methods
- support complex behavior
  - add instance variables
- no recompilation

facilities: driver and framework

- test driver
  - extensible simulated environment
- testing extensions framework

Application

proof of concept: elevator control

- service *s* systems of *f* floors using *e* elevators
- simulated environment
  - cage movement (constant speed, infinite acceleration)
  - inhabited by *p* persons
    - push buttons
    - observe an elevator or floor
- test execution
  - scenario generation (no record or playback)
  - outcome: conditions, invariants

Conclusion

method

- testing software that normally interacts with hardware
  - independent of the hardware
    - usual sw testing methods apply
  - independent of source availability
    - testing extensions are not part of the design

models

- hardware models
  - flexible
  - simple models suffice for high abstraction testing
  - testing is only as good as the models
  - models need to be tested as well