APS4ES & TDD4ES

Applications for Embedded Systems

Test-Driven Development for Embedded Software

Enterprise Programming research group

dr. ing. Jeroen Boydens, EP – Professor
Jeroen.Boydens@khbo.be

ing. Piet Cordemans & Sille Van Landschoot,
EP - Scientific Staff Members

A2B forum 23/09/2010

Content

1. EP Research group
2. Project APS4ES
3. Project TDD4ES
4. General contact

1 EP research group

Founded: 2006 – 2007

http://ep.khbo.be Firstname.Surname@khbo.be

dr. ing. Jeroen Boydens
+ founder
+ professor
+ project leader

ing. Olivier Rosseel
+ academic staff
+ ICTO coach

ing. Piet Cordemans
+ TDD4ES
+ PhD student
+ lab assistant

ing. Sille Van Landschoot
+ TDD4ES

ing. Wim Catteeuw
+ APS4ES

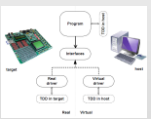
1 EP research group

Threefold mission:

Education

- **Software courses**
  - Prof. Bachelor EO/ICT
  - Ac. Bachelor EO/ICT
  - Master ICT

Research



- **With K.U.Leuven**
  - Concurrent software
  - Software testing
  - Transactional behavior
- **Tetra/PWO/theses**
  - Embedded development methodologies
  - Gaming frameworks

Social services

- **Seminars**
  - Software testing
  - State-of-the-art technologies
- **LED**
  - eg. Medical Reminder System

Content

1. EP Research group
2. Project APS4ES *funded by* KATHOLIEKE HOGESCHOOL BRUGGE - OOSTENDE *(PWO)*
3. Project TDD4ES *funded by* IWT *(TETRA 090191)*
4. General contact

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presented by P. Cordemans

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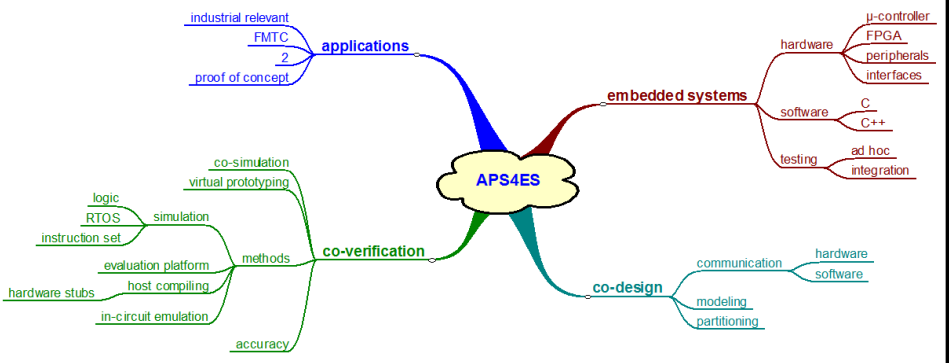
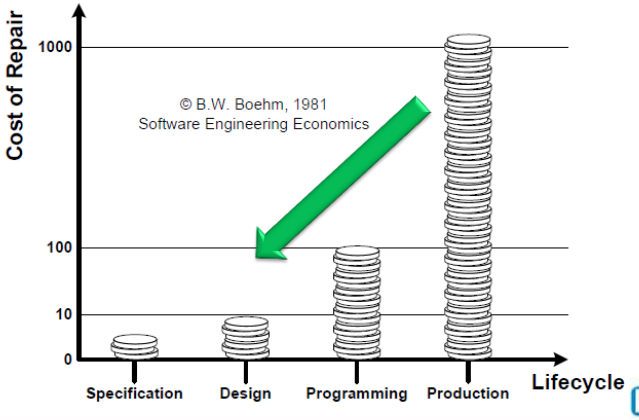
2 Project APS4ES

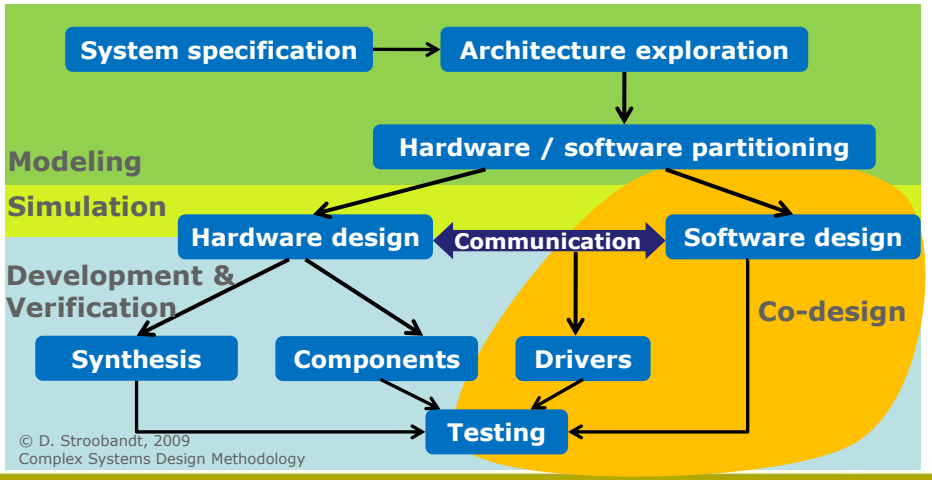


2 Project APS4ES

Timely detection of bugs



2.1 APS4ES: Co-design



2.2 APS4ES: Goals

Goals:

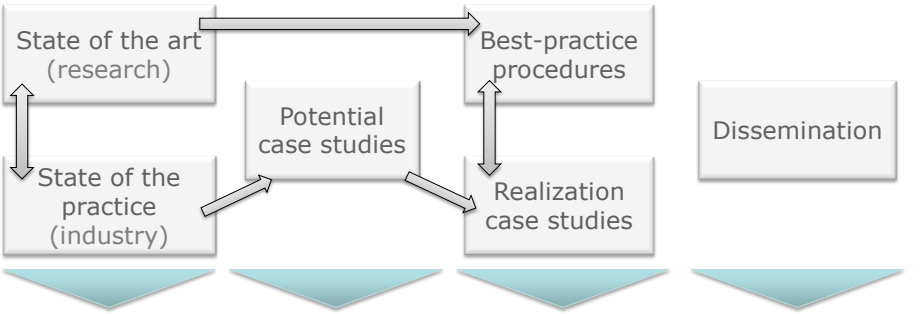
- **Two proof of concept applications**

For example:

1. badminton robot controller
2. stereo vision system (cfr. badminton robot)
3. smart wireless camera
4. autonomous vibration sensor (low power)
5. wireless remote control (safety & low power)
6. object localization unit.
7. service tool for connector monitoring.
8. active damper of vibrations

- **Best practice manual**
  - ➢ Support for professional bachelor courses

2.3 APS4ES: Process



Deliverables

- Literature study
  - Mindmaps
  - Management reviews
- Overview
- Detailed description
- Case studies
- Manual
  - Best-practices
  - Bottlenecks
- CMS
- Seminars
- Publications

2.4 APS4ES: People

Project leader:

dr. ing. Jeroen Boydens

Jeroen.Boydens@khbo.be

Project member:

ing. Wim Catteeuw

Starting:
01/10/2010

Coaches:

ing. Franky Loret, MSc

+ hardware coach

ing. Piet Cordemans

+ software coach

Partners:

www.dspvalley.com

www.fmtc.be

2.5 APS4ES: Resources

EP Content Management System (CMS)
http://ep.khbo.be

Content

presented by S. Van Landschoot

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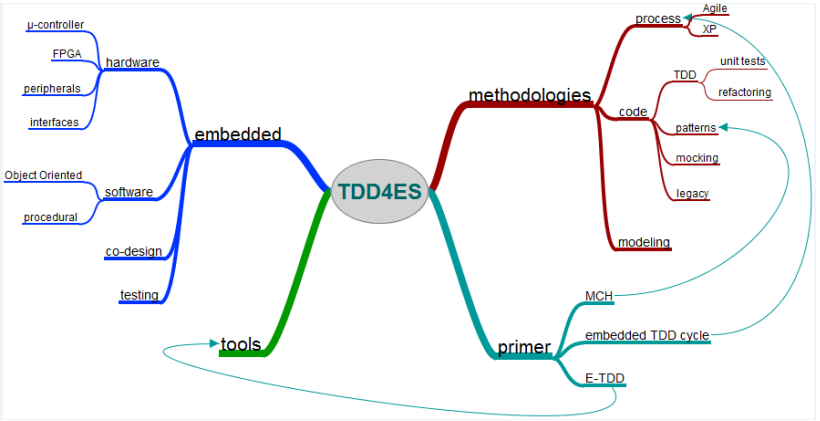
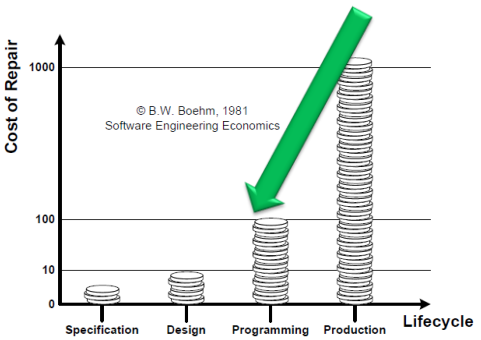
   1. Test-Driven Development
   2. Embedded Strategies
   3. Case studies
   4. New project: DP4CES
   5. People
   6. Resources
4. General contact

3 Project TDD4ES

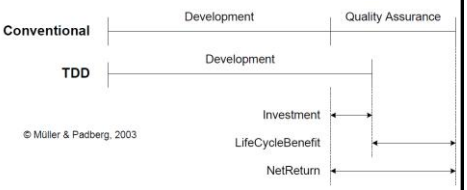


3 Project TDD4ES

Timely detection of bugs



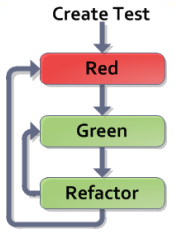
TDD benefit

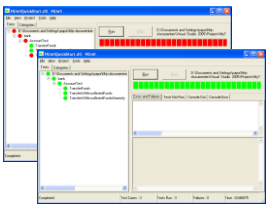


3.1 TDD4ES: TDD

Test-Driven Development

1. Write failing test
   - New behavior
   - Minimal skeleton to get through compilation
2. Write code to pass test
   - Minimal implementation
3. Refactor
   - No new behavior
   - Clean code
   - Keep tests passing

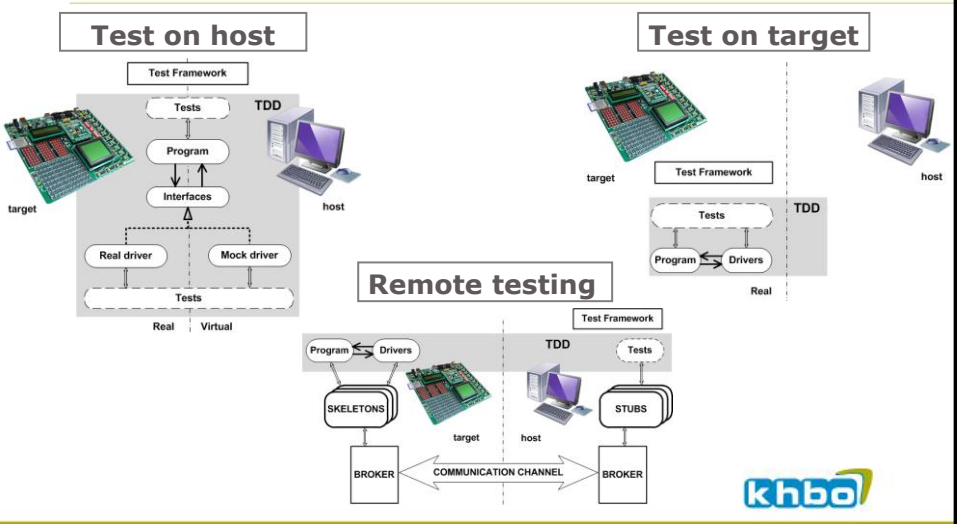




Embedded constraints

1. Memory footprint
2. Slow programming cycle

3.2 TDD4ES: Strategies



3.3 TDD4ES: Case studies

Proof of concept

- Temperature sensor application
- ARM7TDMI development board
- Workshop

Industrial case

- Loom control system
- NIOS II softprocessor
- Motor emulation

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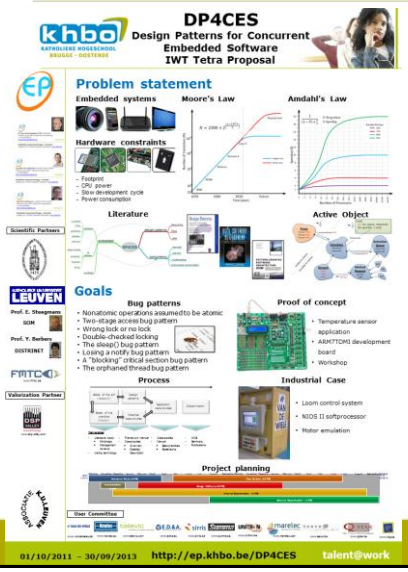
3.4 New project: DP4CES



- Design patterns
- Concurrent embedded software

- IWT Tetra proposal
- User committee

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3.5 TDD4ES: People

Project leader:

dr. ing. Jeroen Boydens
Jeroen.Boydens@khbo.be

Project members:

ing. Piet Cordemans

ing. Sille Van Landschoot

Scientific partners: KATHOLIEKE UNIVERSITEIT LEUVEN

prof. dr. ir. Eric Steegmans
+ SOM research group

prof. dr. ir. Yolande Berbers
+ DISTRINET research group

User committee:

www.tesco.be www.marelec.com www.vandewiele.com www.sirris.be www.edna.eu www.dspvalley.com

www.summa.be www.televic.com www.newtec.eu www.fmtc.be www.qstar.be www.unitron.be

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3.6 TDD4ES: Resources

EP Content Management System (CMS)
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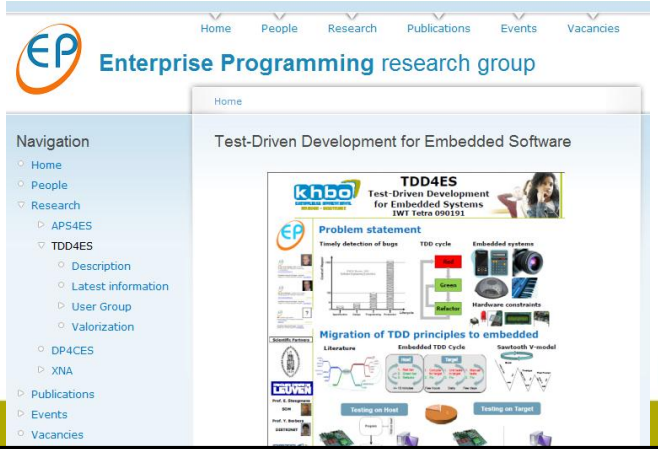

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4 General contact

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Food for thought:

"If you want more effective programmers, you will discover that they should not waste their time debugging, they should not introduce the bugs to start with."

Edsger Dijkstra, The Humble Programmer (1972)