Architecture of Digital Systems II

Winter 2017/2018

apl. Prof. Dr. Dominik Stoffel
Entwurf informationstechnischer Systeme
Fachbereich Elektrotechnik und Informationstechnik
Technische Universität Kaiserslautern

Phone: (0631) 205-2684 Email: stoffel@eit.uni-kl.de

Weekly Schedule

Lecture	Wednesday, 13:45 – 15:15, Room 11-207
Exercises	on several Thursdays (check web page), 15:30 – 17:00, Room 46-210

Please check out the lecture's web page regularly for changes in the schedule or other announcements!

https://www.eit.uni-kl.de/eis/teaching/85-573/

Exercises

- Exercises are carried out as homework
- Solutions will be discussed in the classroom
- *Everybody should present the solutions to an assignment once in the semester*
- Exercise sessions are 90 minutes,
  take place about every two weeks
- Exact dates are posted on the lecture's web page
- Exercises are tutored by:
  Dipl.-Ing. Thomas Fehmel fehmel@eit.uni-kl.de

Material

Download

- presentation slides (PDF files)
- exercise tasks

from the OpenOLAT page of the course.

OpenOLAT: https://olat.vcrp.de/dmz/

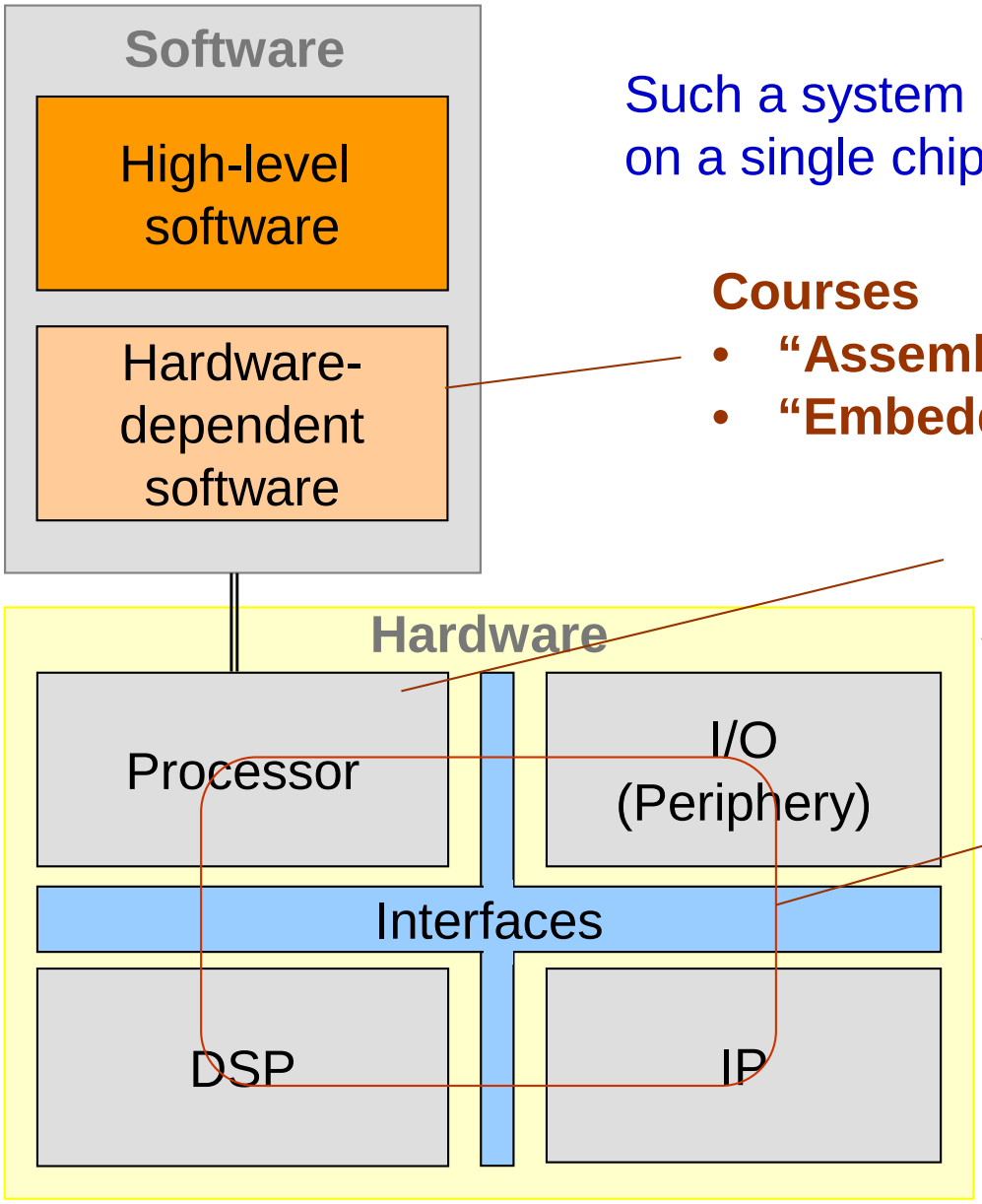
If you find errors in the material or have comments, please contact me! Your input is very much appreciated!

Some of the material (mostly examples) will be presented on the blackboard!

Exam

- The exam is an oral exam.
- Exam dates will be announced towards the end of the semester.
- You need to register for the exam:
  - with the authorities responsible for your study program (Prüfungsamt)
  - also with us to be assigned a date and time for the exam, using an online registration system
- Details will be announced on our web page.

Lecture Contents: Computer *Systems*



Such a system can be completely integrated on a single chip: “System-on-Chip (SoC)”

Courses
- **“Assembler Programming” (Fohler)**
- **“Embedded Systems Lab”**

Course “Architecture of Digital Systems I”

Course “Architecture of Digital Systems II”

Focus of this lecture: "Embedded Systems"

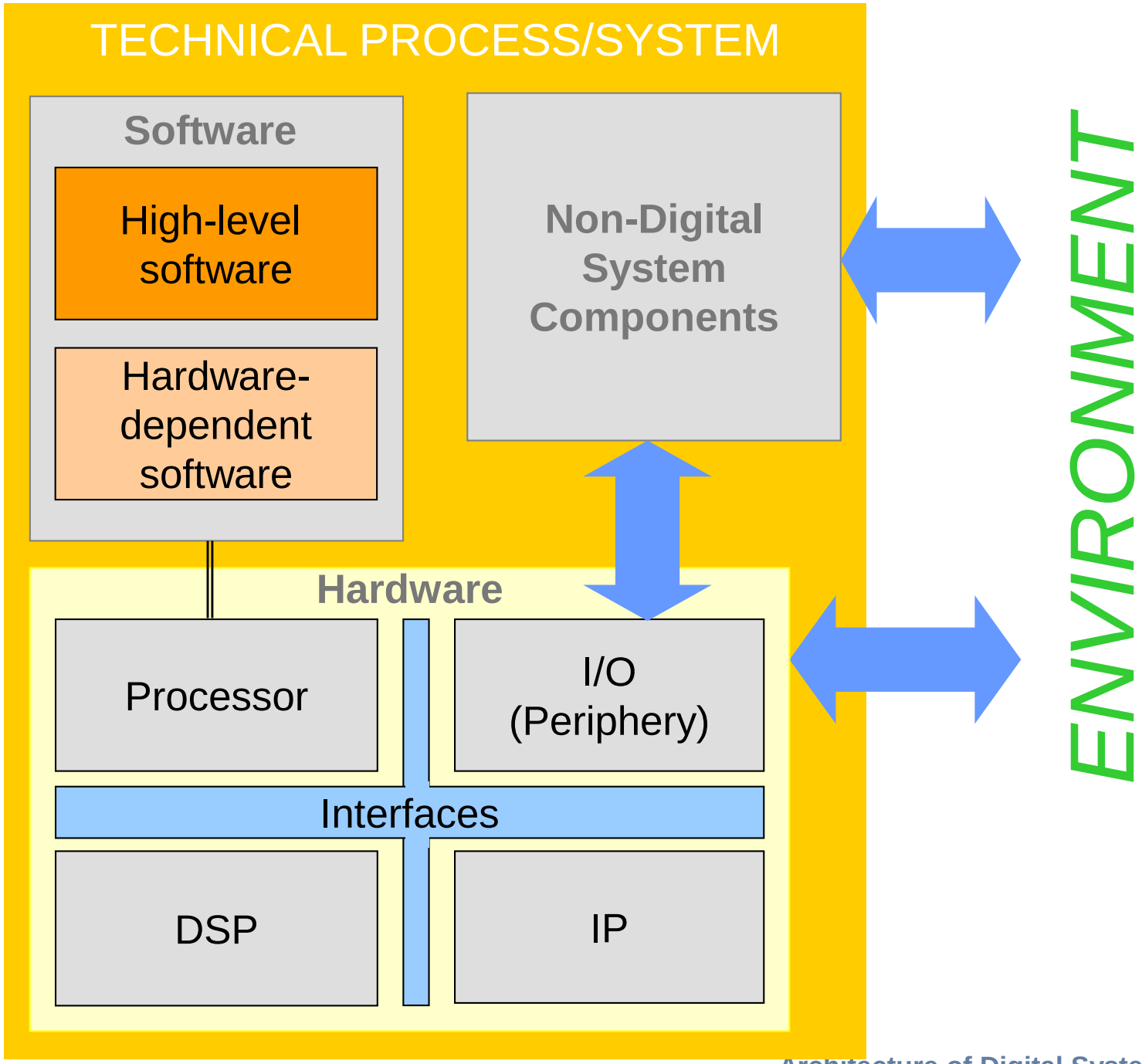
What is an Embedded System?

... A device that *includes* a programmable computer but is not itself intended to be a general-purpose computer:

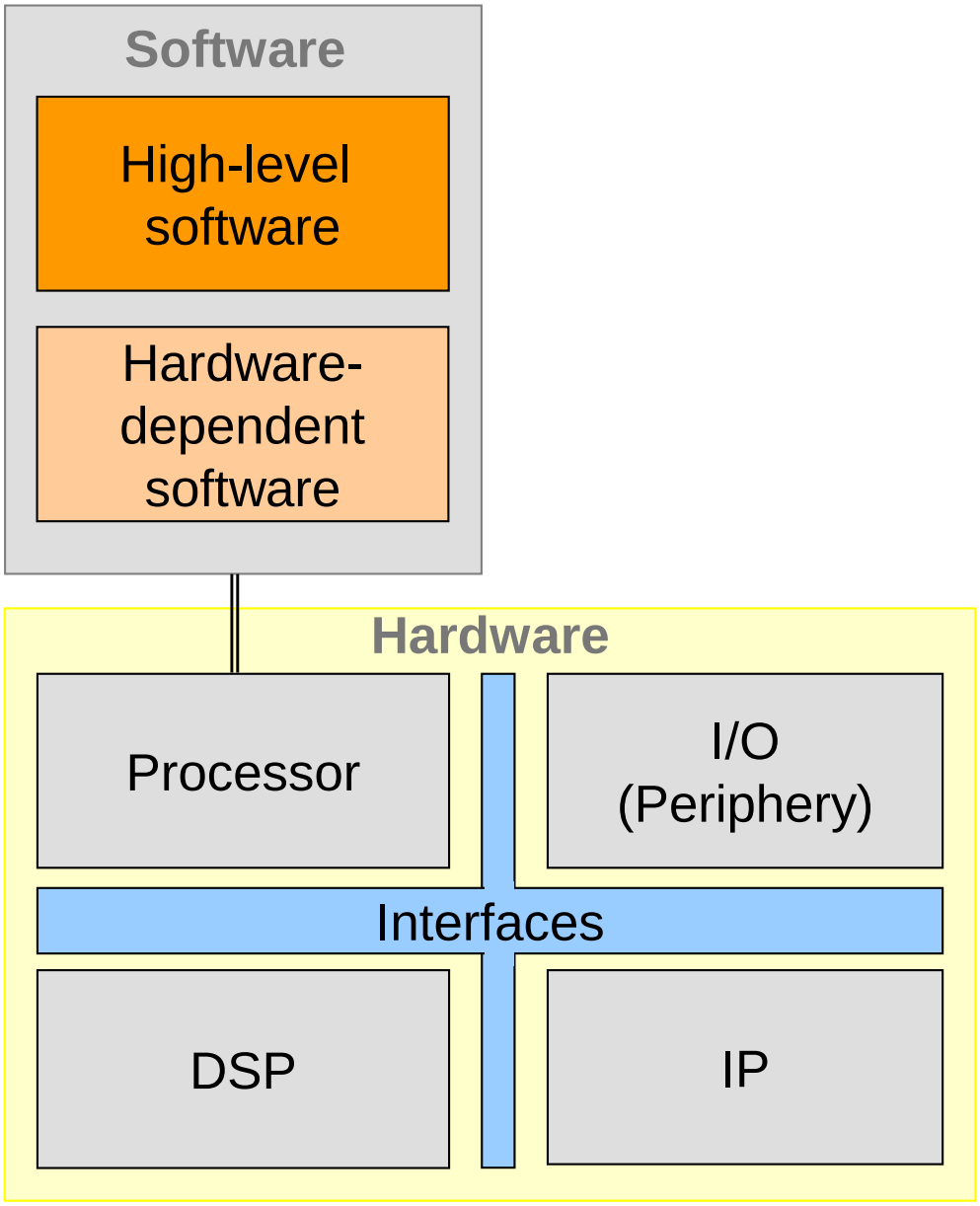
- The processor is integrated into a larger system, such as a cell phone, a car, a household appliance, etc.
- The device interacts with the system environment (sensors, actuators).
- It cannot be used as a general-purpose computer.
- It fulfills application-specific tasks.

More than 90% of all processors sold world-wide are used in “embedded” applications.
European industry is traditionally strong in "embedded systems".

Computer System Embedded in a Technical Process

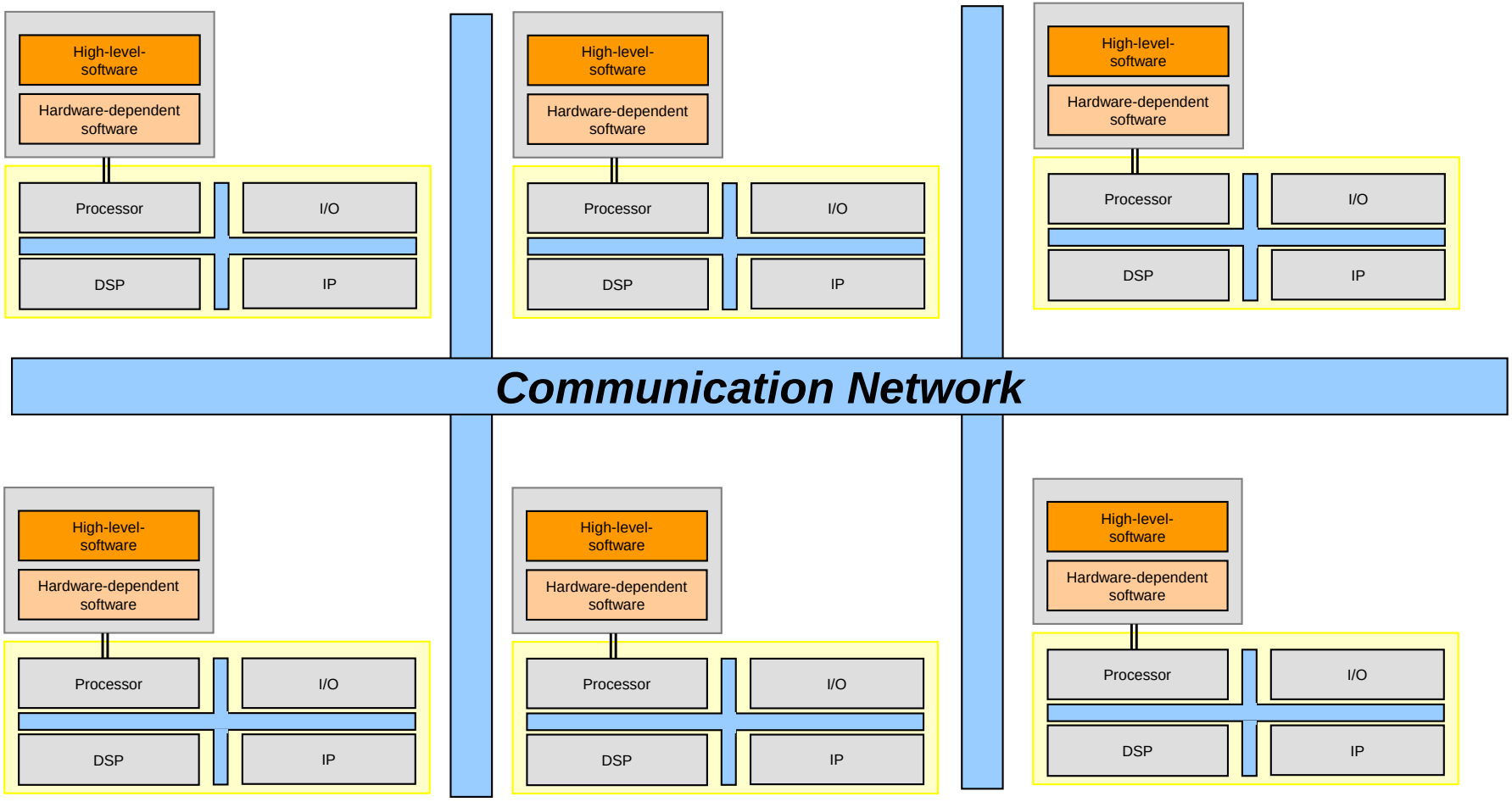


"Embedded System"



"Distributed Embedded System"

Courses:
“Architecture of Digital Systems II"
"Real-Time Systems I, II"



Your background

- Fundamentals of Digital Design
- Computer Architecture
  (as taught in lecture “Architecture of Digital Systems I”; course can be taken in the same semester)
  - Data representation, computer arithmetic
  - Instruction set and machine language
  - Datapath and control (hardware implementation, control unit design, microprogramming)
  - Instruction-level parallelism
  - Memory hierarchy
- Assembler programming
  (course or personal experience)
- Note: Courses ADS-I and ADS-II can be taken concurrently

Course Outline

1. Introduction – Designing Embedded Systems
2. Microprocessor Instruction Sets
3. Microprocessor Interfaces
4. Processes and Operating Systems
5. Multiprocessors
6. Networks and Distributed Systems

A. Formalizing System Design with UML

Literature

[1] Wayne Wolf:
Computers as Components – Principles of Embedded Computing System Design,
2nd Edition, Morgan Kaufmann, 2008, ISBN: 978-0-12-374397

[2] Patterson/Hennessy:
Computer Organization and Design - The Hardware/Software-Interface,
5th Edition, Morgan Kaufmann Publishers, 2013, ISBN: 978-0124077263

[3] Hennessy/Patterson:
Computer Architecture - A Quantitative Approach,
5th Edition, Morgan Kaufmann, 2011, ISBN: 978-0123838728

[4] Andrew S. Tanenbaum:
Structured Computer Organization,
5th edition, Prentice Hall, 2005, ISBN: 978-0131485211

[5] Peter S. Pacheco:
An Introduction to Parallel Programming,
Morgan Kaufmann Publishers, 2011, ISBN: 978-0-12-374260-5

Please: Don‘t take photos, don‘t make recordings!

Thanks!