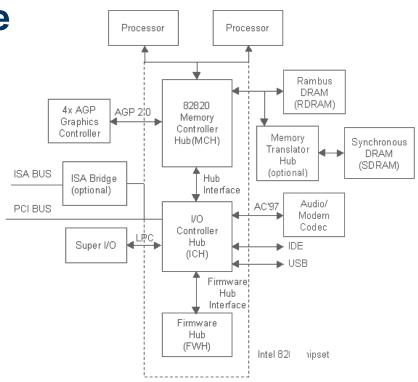


TI II: Computer Architecture

Prof. Dr.-Ing. Jochen Schiller Computer Systems & Telematics Freie Universität Berlin, Germany





Structure/content of CST-Lectures

SW/HW-Lab mobile, embedded Systems

SDR, security architectures, IoT, localization, bring your own topic...

Microprocessor Lab

Programming of embedded systems, IoT, mobile/wireless devices

Seminar Computer Systems

Presentation & discussion of current topics from all lectures

Modeling and Simulation

Modeling, Simulation and Evaluation of Systems

Embedded Internet and the IoT

Wireless sensor networks, wireless mesh networks, Internet of Things, etc.

Mobile Communications

Wireless transmission, media access, GSM, 3G, LTE, WLAN, mobile IP, ad-hoc networks

Telematics / Advanced Computer Networks

Protocols, services, standards, LAN, Internet, TCP/IP, WWW, security, quality of service, DNS, routing, applications, IPv6, MPLS

Master Bachelor

You

are

here!

Computer Systems Lab (TI IV)

Embedded systems, interfaces, drivers, operating systems, networking, integration

Operating Systems and Computer Networks (TI III)

Input/output, DMA/PIO, interrupts, buffer, process/thread, UNIX/Windows, networks, media access, protocols, TCP/IP, Internet

Computer Architecture (TI II)

Harvard/v. Neumann, micro architecture, RISC/CISC, branch prediction, pipelining, cache, memory hierarchy, assembler, multi-processor systems

Basics of Computer Systems (TII)

Boolean algebra, circuits, minimization, gates, memory, semiconductors, transistors, CMOS, AD/DA conversion

Module

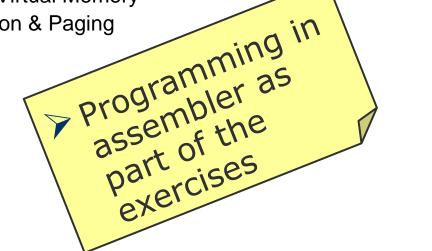
Computer Architecture, Operating Systems and Computer Networks



Content

- Introduction
 - Single Processor Systems
 - Historical overview
 - Six-level computer architecture
- 2. Data representation and Computer arithmetic
 - Data and number representation
 - Basic arithmetic
- Microarchitecture
 - Microprocessor architecture
 - Microprogramming
 - Pipelining

- 4. Instruction Set Architecture
 - CISC vs. RISC
 - Data types, Addressing, Instructions
 - Assembler
- 5. Memories
 - Hierarchy, Types
 - Physical & Virtual Memory
 - Segmentation & Paging
 - Caches

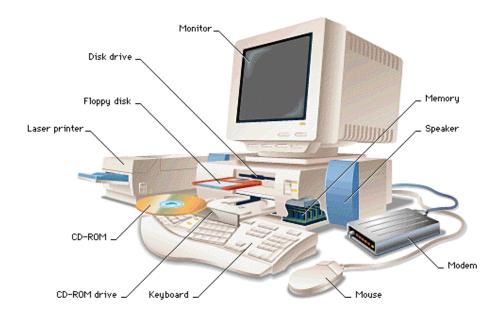




Topics of this Course

Have you ever ...

- opened the case of a computer?
- assembled a computer from components?
- written a program in Java/Python/Rust/JavaScript?
- written a program in C?
- written a program in Assembler?











Topics of this Course

At the end of this course, you should ...

- know the different components of a computer system
- know the internals of a computer
- know how a computer stores data, i.e., text, audio, video
- know how a program is executed
- be able to write small assembler programs
- understand basic arithmetic

This should help you to

- understand computers in general
- understand how high-level programming languages are translated into machine language
- improve your programming skills
- optimize the performance of your programs





Literature

The course follows (roughly) the books:

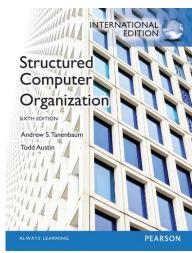
- A. S. Tanenbaum, T. Austin:
 Structured Computer Organization, 6. edition,
 Pearson, 2013

Rechnerarchitektur, 6. Auflage, Pearson Studium, 2014

- D. A. Patterson, J. L. Hennesy: Computer Organization and Design, 5. edition, Morgan Kaufmann, 2013

Rechnerorganisation und -entwurf, 5. Auflage, De Gruyter, 2016











Course Organization

General:

Lecture

- Available online
- Flipped-classroom: Q&A, discussions, Friday, 8:30-10h, via Webex (invitations see KVV)

Office Hours

- Jochen Schiller: via email or https://fu-berlin.webex.com/meet/jochen.schiller
- Tutors: during tutorials

News and Updates

- KVV course site (via announcements)

Tutorials

- Groups of approx. 25-30 students
- Time depends on group
- Registration via KVV

Q&A virtuality of the control of the

New assignments each week

- Available in KVV

Discussion

- During the tutorials

Practical assignments

- @home and in the labs, should work on all platforms
- More during Q&A/tutorials

Handing in

- > Right on time!
- Complete electronic workflow!
- Solutions handed in too late will be ignored!

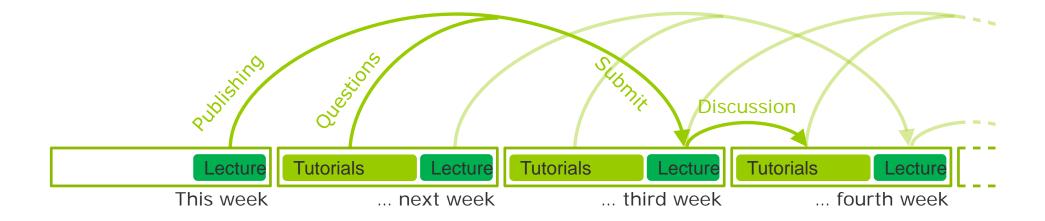


Assignments

Exercises: Available on Fridays in KVV after Q&A

Submission: Two weeks later until start of class (Fri, 8:30)

Discussion: Three weeks later in tutorials





Criteria for Successful Participation

Active participation in the tutorials is essential!

- Minimum n-2 times present

Hand in your assignments on time

- Teamwork is required with 2 students per team

Successful submission of at least n-2 assignments

Each student with a correct answer must be able to present the assignment during the tutorials

- At least one presentation during the tutorials

At least 50% of the max. number of points in the exam are required

Only the exam counts for grading!

Exam: to be announced





RIOT-OS

The friendly Operating System for the Internet of Things.



http://riot-os.org/