TI III: Operating Systems & Computer Networks

Organization

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Figure 2.16 Modern UNIX Kernel [VAHA96]
Structure/content of CST-Lectures

- **Basics of Computer Systems (TI I)**
  - Boolean algebra, circuits, minimization, gates, memory, semiconductors, transistors, CMOS, AD/DA conversion

- **Computer Architecture (TI II)**
  - Harvard/v. Neumann, micro architecture, RISC/CISC, branch prediction, pipelining, cache, memory hierarchy, assembler, multi-processor systems

- **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 Systems Lab (TI IV)**
  - Embedded systems, interfaces, drivers, operating systems, networking, integration

- **Telematics / Advanced Computer Networks**
  - Protocols, services, standards, LAN, Internet, TCP/IP, WWW, security, quality of service, DNS, routing, applications, IPv6, MPLS

- **Microprocessor Lab**
  - Programming of embedded systems, IoT, mobile/wireless devices

- **Seminar Computer Systems**
  - Presentation & discussion of current topics from all lectures

- **SW/HW-Lab mobile, embedded Systems**
  - SDR, security architectures, IoT, localization, bring your own topic...

- **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

- **Modeling and Simulation**
  - Modeling, Simulation and Evaluation of Systems

- **You are here!**
Content

1. Introduction and Motivation
   - Tasks
   - Services
   - Virtual Resources
   - Historical Perspective
   - Examples
   - Tools

2. Subsystems, Interrupts and System Calls
   - System Structure
   - Flow of Control
   - System Library
   - POSIX

3. Processes
   - Definition
   - Implementation
   - State Model

4. Memory
   - Paging & Segmentation
   - Virtual Memory
   - Swap Policies

5. Scheduling
   - Types of Scheduling
   - Decision Modes
   - Process Priorities
   - Scheduling Policies

6. I/O and File System
   - Devices
   - Buffering and Caching
   - Files and Directories

7. Booting, Services, and Security
   - System Startup
   - System Services
   - Security Issues
Content

8. Networked Computer & Internet
   - Sockets
   - Internet
   - Layers
   - Protocols

9. Host-to-Network I
   - Physical Layer
   - Media
   - Signals
   - Modems

10. Host-to-Network II
    - Data Link Layer
    - Framing, Flow Control
    - Error Detection / Correction
    - Point-to-Point Protocol

11. Host-to-Network III
    - Topologies
    - Medium Access
    - Local Area Networks
      - Ethernet, WLAN

12. Internetworking
    - Switches, Routers
    - Routing
    - Internet Protocol
    - Addressing

13. Transport Layer
    - Protocol Mechanisms
    - TCP, UDP
    - Addressing, Ports
Content

14. Applications
   - Domain Name System
   - Email
   - World Wide Web

15. Network Security
   - Basic Concepts & Terms
   - Cryptology
   - Examples
     - Firewalls
     - Virtual Private Networks (VPNs)
     - IP Security
     - Email Security with PGP

16. Example
   - Under the Hood of Surfing the Web

Programming in C as part of the exercises
Course Organization

General:

Lecture
- Available online
- Flipped-classroom: Q&A, discussions, Friday, 10-12h, via Webex (invitations see KVV)

Office Hours
- Jochen Schiller: Tue 14:00-15:00, https://fu-berlin.webex.com/meet/jochen.schiller or via email
- 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

Assignments:

New assignments each week
- Available in KVV

Discussion
- During the tutorials

Practical assignments
- @home, 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

Übungsblätter: Available on Fridays in KVV after Q&A
Submission: Two weeks later until start of class (Fri, 10:15)
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
Literature

Archive of the lectures! – see KVV for links
- Prepare yourself! Follow the lecture BEFORE Q&A
- Prepare a list of questions & discuss during Q&A

The course is based on:
- Larry L. Peterson, Bruce S. Davie, Computernetze – Eine systemorientierte Einführung, dpunkt Verlag

Additional literature:
- Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall
- Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, John Wiley & Sons
RIOT-OS

The friendly Operating System for the Internet of Things.

http://riot-os.org/
OS-support for HPC (Grids)