Betriebssysteme

0. Tutorium - Setup, Basics

Peter Bohner

24. Oktober 2024

ITEC - Operating Systems Group

Über uns

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Ich

- Peter Bohner (peter.bohner@student.kit.edu)

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- armer Student im **7.** Semester

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Ihr

- ~~Name?~~
- Studiengang? Ich tippe mal Info :)
- Programmierkenntnisse Richtung C?
- Schon mal was mit Betriebssystemen gemacht?
- Linux Erfahrung?
- Aktuelle Hardware
- Erwartungen?

Organisatorisches

Vorlesung

- Übungsschein? Nein.

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- Übungsblätter optional (aber sinnvoll!) *Es muss nicht jedes Blatt abgegeben werden. Bei Abgabe müssen nicht alle Aufgaben bearbeitet werden.*

Organisatorisches

Fragen Stellen (in dieser Reihenfolge)

1. im Tutorium
2. im ILIAS-Forum
3. per E-Mail an euren Tutor
4. per E-Mail an Übungsleitung
5. per E-Mail an Professor

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- *per du*
- aktive Mitarbeit, nimmt eure Laptops mit!

OS - Tasks and Responsibilities

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Abstraction / Standardization

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⇒ Abstract away hardware details!

Operating System – Tasks and Responsibilities

Resource management

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Resource management

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- You want to access the storage drive? Too bad, another program is already doing that.
- You want to get CPU time? Too bad, this `while (true)` loop is more important.
- ...

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- You write a cool little program that fills a buffer with a random value. Sadly you made a mistake and missed a bounds check. What happens?

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- You copied a password to your clipboard? ⇒ Ooops. You're on your own there. The Clipboard is not provided by the OS and mostly has no special protections.
- You write a cool little program that fills a buffer with a random value. Sadly you made a mistake and missed a bounds check. What happens? You crash, but your text editor doesn't suddenly have its memory overwritten!
- ...

Operating System – Tasks and Responsibilities

Provide an execution environment for applications

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Provide an execution environment for applications

- What does that mean?

Operating System – Tasks and Responsibilities

Provide an execution environment for applications

- What does that mean? Basically all of the above combined and more. Make a homely place where applications like to live!

Kernel and user mode

What are the differences between a processor running in kernel or user mode? Why are both modes needed?

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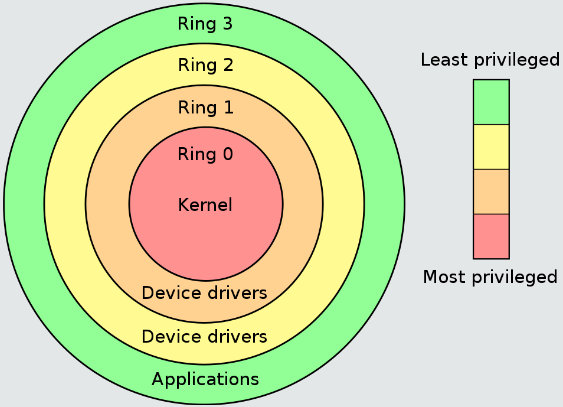

Wikipedia - Hertzsprung

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- In kernel mode you have full access to privileged instructions.

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- Is `MOV` (Move) a priviledged instruction? Yes, if moving to debug/control registers!

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- Calling convention (e.g. `cdecl` or `System V AMD64 ABI`)
- Basic data types and their size / alignment (`int`, `sizeof(int)`)
- How to perform System Calls

ABI

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This is used when talking about *binary compatibility* of different library versions.

⇒ Do you need to recompile your code against the new version?

ABI

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`System V AMD64 ABI`

`https://godbolt.org/z/68xexn`

- Integer arguments in `rdi`, `rsi`, `rdx`, `rcx`, `r8`, `r9`, then stack
- FP arguments in `xmm0` to `xmm7`
- Integer return value in `rax`, `rdx`

Installation

Installation

x86_64 linux - install these packages

- gcc (nicht clang!), make, bash, git, gdb
- a text editor of your choice

MacOS - you are probably not afraid of your terminal either

- install UTM, Vagrant or qemu-system-x86_64 (homebrew)
- install a x86_64 (not ARM!) Linux guest `https://docs.getutm.app/guides/debian/`
- → Linux
- (optional: shared folder)

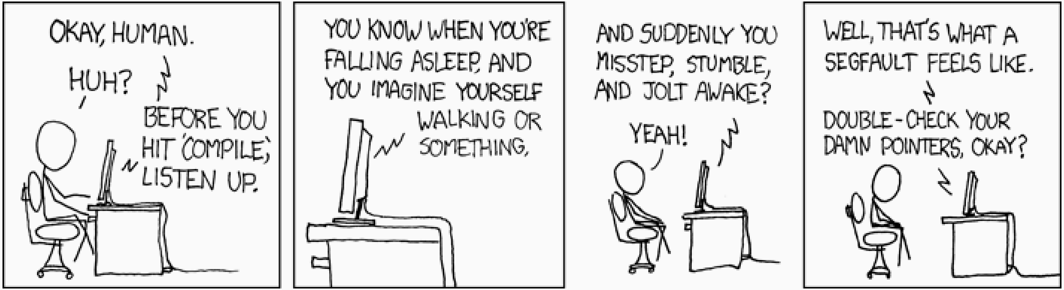
Installation

Windows

- install WSL2 (you may need to be on *KA-WLAN* instead of *KIT* wifi, because *$REASONS*) (admin Powershell: *wsl –install*)
- `https://learn.microsoft.com/en-us/windows/wsl/install`
- oder: `https://learn.microsoft.com/en-us/windows/wsl/install-manual`
- install a text editor (z.B. vscode, Notepad++)
- Ubuntu-shell: ∼ $ *sudo apt update && sudo apt install build-essential git gdb*

or: use ATIS ssh server

FRAGEN?


OKAY, HUMAN.
HUH?
BEFORE YOU HIT 'COMPILE,' LISTEN UP.
YOU KNOW WHEN YOU'RE FALLING ASLEEP, AND YOU IMAGINE YOURSELF WALKING OR SOMETHING,
AND SUDDENLY YOU MISSTEP, STUMBLE, AND JOLT AWAKE?
YEAH!
WELL, THAT'S WHAT A SEGFAULT FEELS LIKE.
DOUBLE-CHECK YOUR DAMN POINTERS, OKAY?

XKCD 372 - Compiler Complaint

Bis nächste Woche :)