

Memory Management

Marius Müller

Universität Tübingen

Procedure

- We will have weekly meetings on Thursday 14-16.
The first presentation is on May 02 (two weeks from the first meeting).
- The speaker gives a presentation of about 30-35 min and leads the discussion of about 10 min afterwards.
- Everybody will be the speaker two times.

Speaker

As the speaker you prepare your presentation and prepare for the ensuing discussion. In particular, you

- read (a proper selection of) the resources given to you
- potentially collect and read some more resources
- develop a detailed knowledge of your topic
- prepare slides for your presentation
- briefly discuss your presentation with me prior to giving it (e.g., right before or after the seminar of the previous week, or via zoom)
- keep the discussion on track and within the time limit

Registration

If possible, register on alma. In addition, register with me via mail until Monday, April 22!
Please send an e-mail (to mari.mueller@uni-tuebingen.de) with the following information

- Matrikelnummer
- name
- Studiengang + Abschluss
- Fachsemester
- your student e-mail address

Seminar Details

- Proseminar, 3 ECTS
- Grading components
 - presentations
 - discussions afterwards (active participation in discussion is expected)

Topics

We will have 8-10 presentations. The core topics (that will definitely be presented) are

- Operating System & Virtual Memory (address translation, paging, TLB, swapping)
- Manual Memory Management (à la C (C++)) & Allocators (stack vs. heap, memory safety, memory leak, malloc/free)
- Garbage Collectors: Basics & Mark-Sweep (basic terminology, tri-colour abstraction, cache locality)
- Moving Garbage Collectors (mark-compact, semi-space, cache/page locality)
- Reference Counting (lazy, deferred, coalesced, cycles)
- Heap Partitioning for GC (generational GC, large-object spaces, topological collectors)
- Region-Based Memory Management (inferred vs explicit, stack of regions, arenas)
- Linearity, Ownership, Borrowing (à la Rust) (lifetimes, move semantics, RAI, smart pointers)

Topics

Further possible topics are

- Comparing & Unifying Tracing and RC (common framework for GC)
- Implementation-Related Issues for GC (finding pointers, GC-safe points, read/write barriers)
- Garbage-Free Reference Counting with Reuse (Perceus)
- (Concurrent GC)
- Mutable Value Semantics (mutable values but second class references, copy-on-write)
- Regions, Linearity & Capabilities (regions made safe with linearity and capabilities)
- Generational References (references have generations for safety)
- (As Static As Possible)

Please send an e-mail with your preferences for the topics to present to mari.mueller@uni-tuebingen.de.