

# The Coming OS Revolution

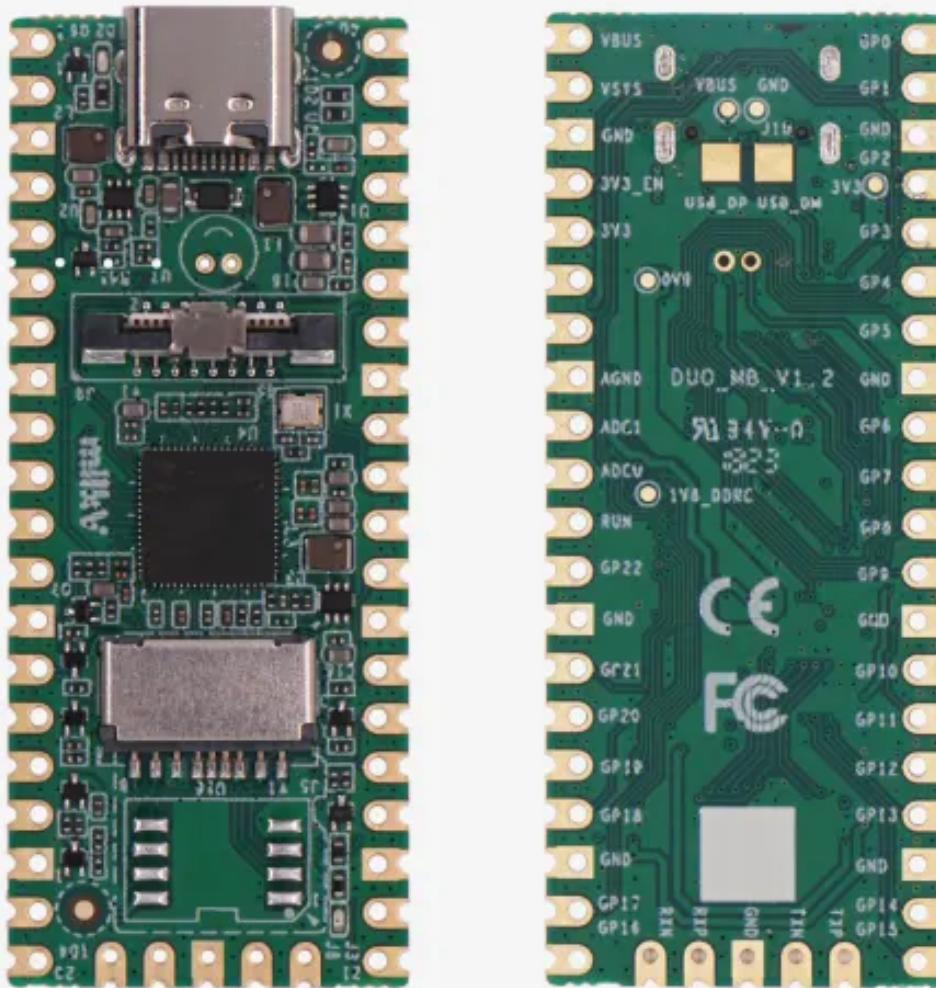
Smarter Operating Systems will use **WASM**

# Jonas Kruckenberg

- Previously Tauri
- TC39 Invited Expert
- ~2 years OS development
- Favorite artists: Vampire Weekend, Vulfpeck, Gustav Mahler







# Thirst for compute

Do the thing faster!

- Increase clock speeds
- Bigger pipelines
- Smaller manufacturing nodes
- Problems: Heat & Cost

# Growing Workloads

Do the thing faster!

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- Problems: Heat & Cost

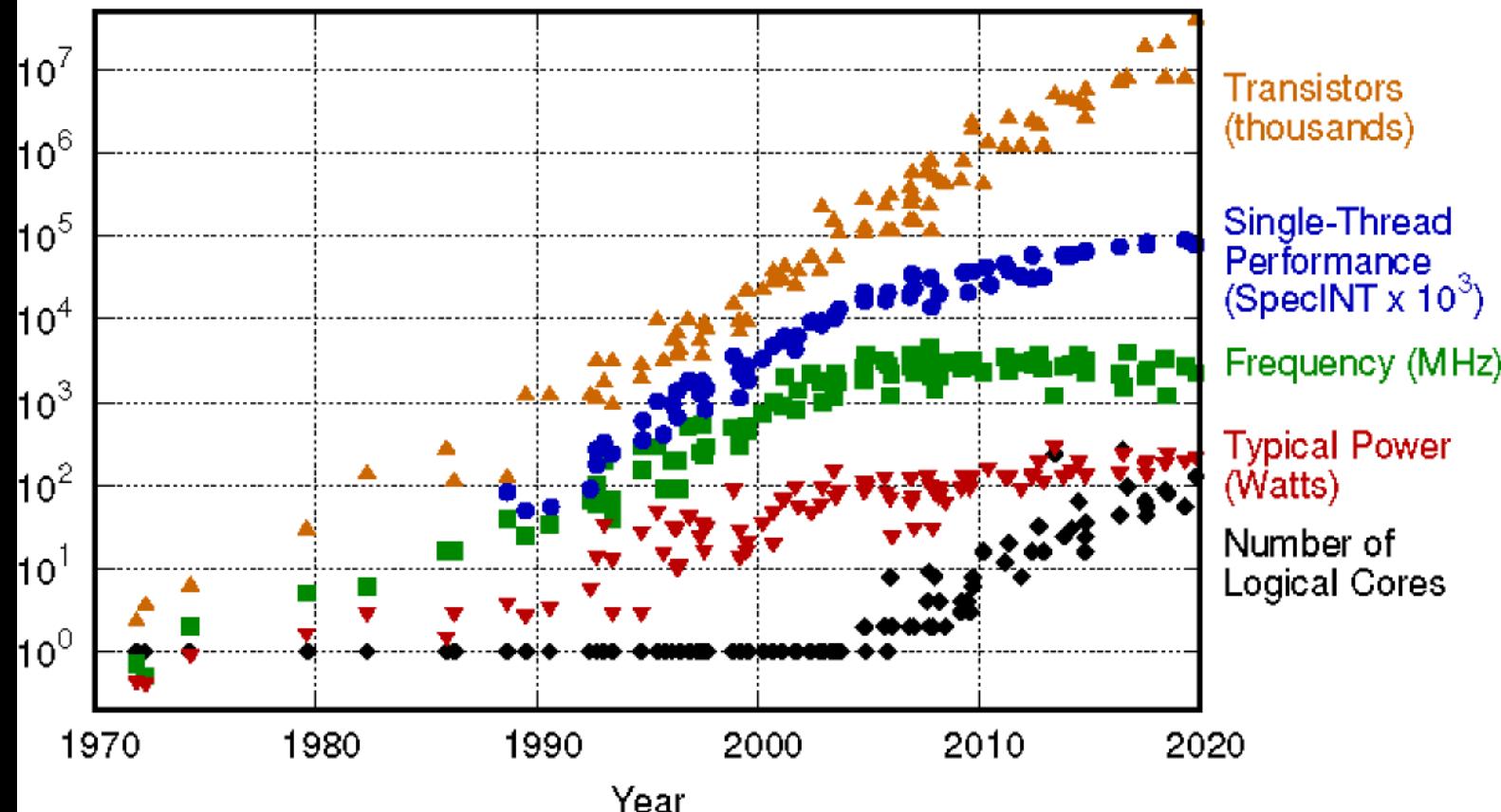


Do many things at once!

- Multiple cores
- Single-instruction multiple-data (SIMD)
- Cheaper to manufacture
- Problem:

Humans suck  
at parallelism

## 48 Years of Microprocessor Trend Data



Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten  
New plot and data collected for 2010-2019 by K. Rupp

# Cybersecurity

- “Commercial” and State-sponsored
- War and conflicts are also fought in cyberspace
- Computer adoption expected to grow worldwide

Cybersecurity will only become  
**\*more\*** important

This is  
exciting!

# k23

## Knowledge

- More declarative
- Easier to analyze

## Sandboxing

- Tighter packing of modules/components
- Better use of machine resources

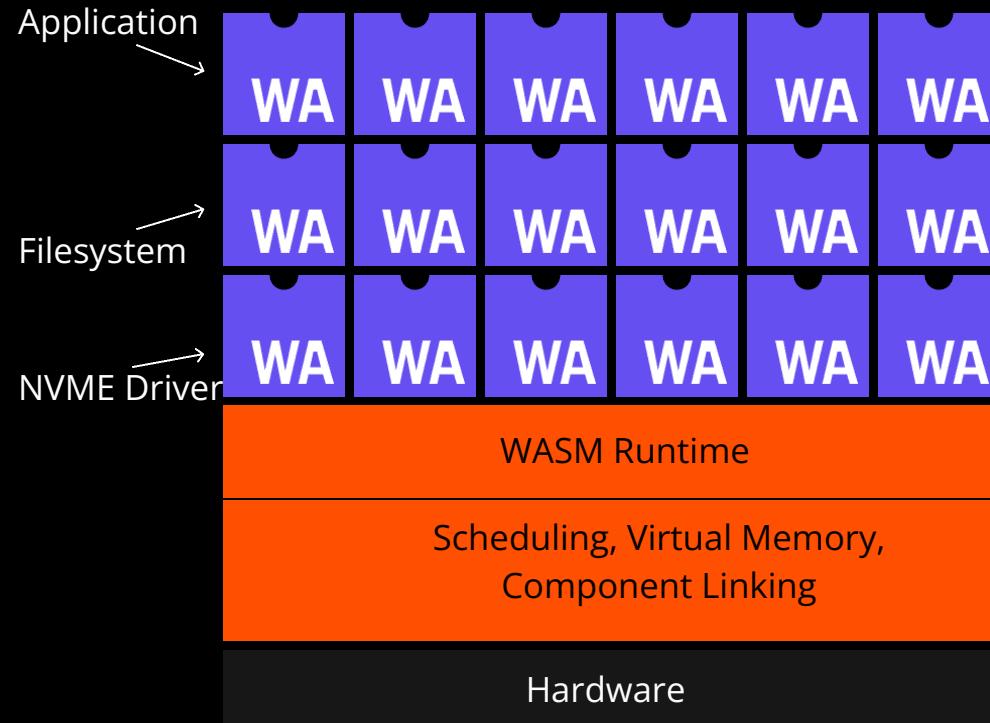
## JIT Compiler

- Heterogeneous architectures
- Incredibly powerful

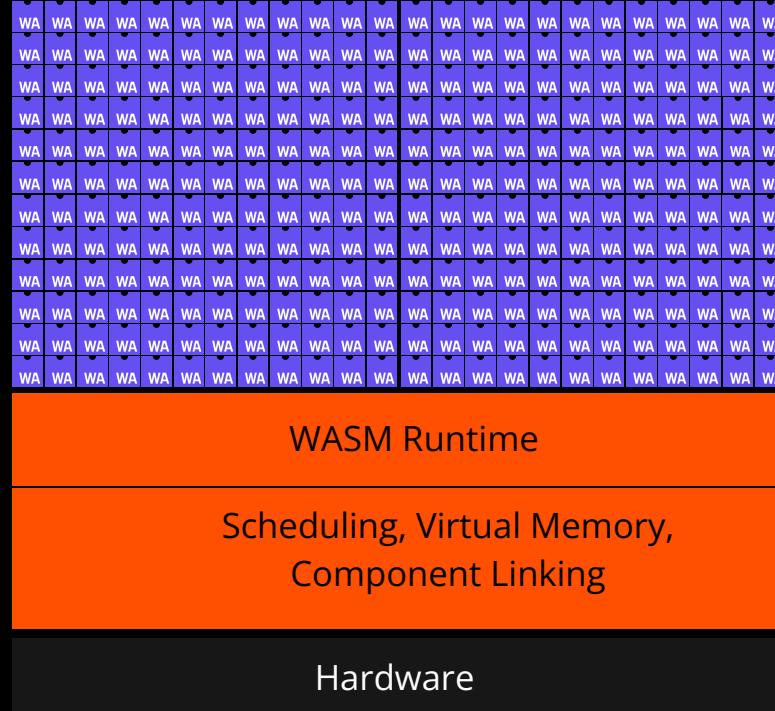
ELF/PE



k23



# k23





WASM as  
Executable Format

Debugging | Profiling | Observability

Microkernel  
Architecture

# k23

Lightweight  
Tasks



Written  
in Rust

Massive  
Concurrency



Aarch64 | x86 | RISC-V

# Project Status

## Completed

- RISC-V Support
- Virtual Memory Subsystem
- Task System & Scheduler
- IO / Interrupt Reactor
- Timers
- WASM Engine
  - Cranelift
  - WASM MVP
  - Imports, Exports, Linking

## Missing

- Host functions
- Drivers
- A million other things



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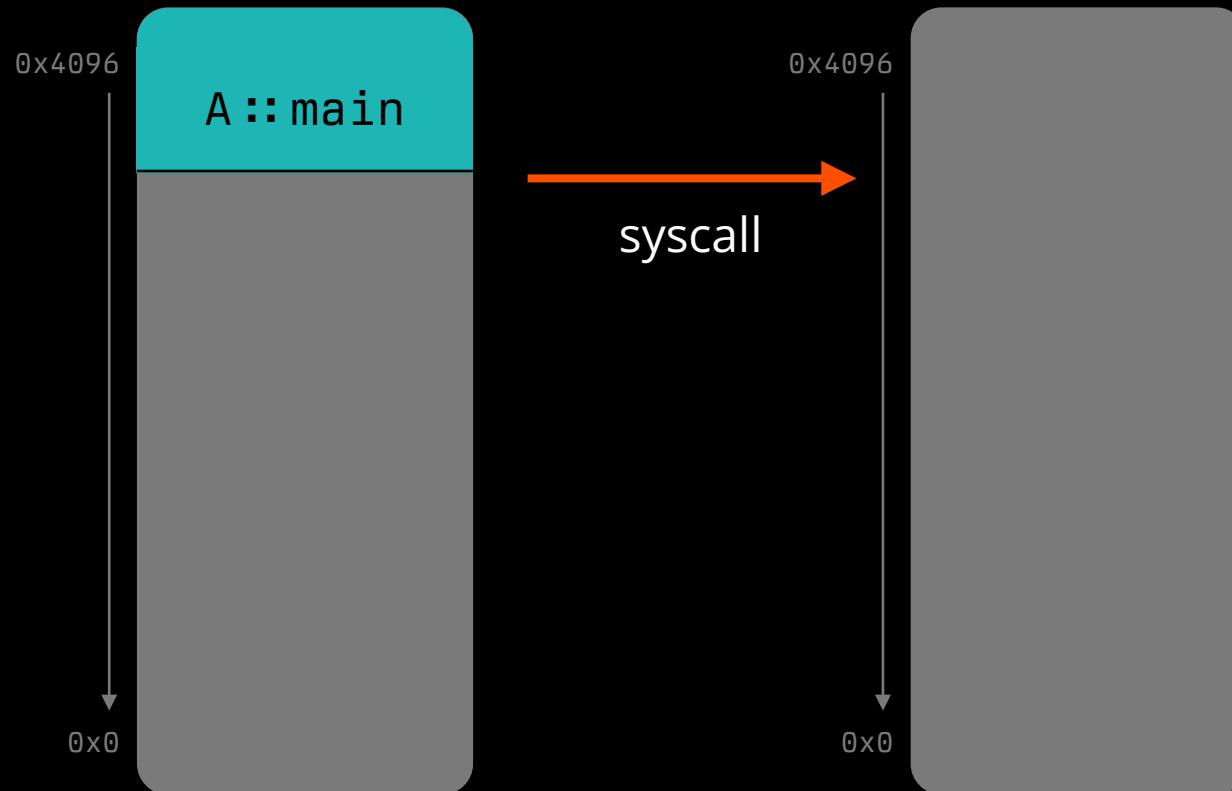


Aarch64 | x86 | RISC-V

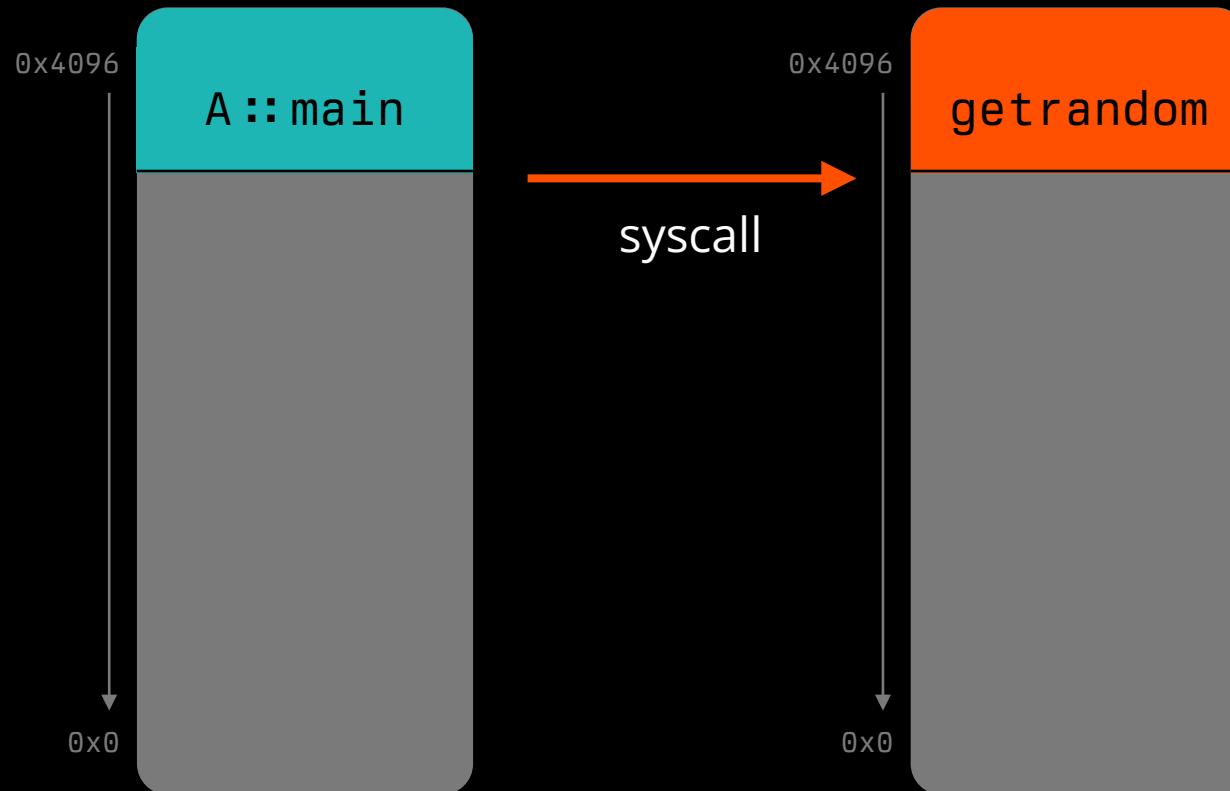


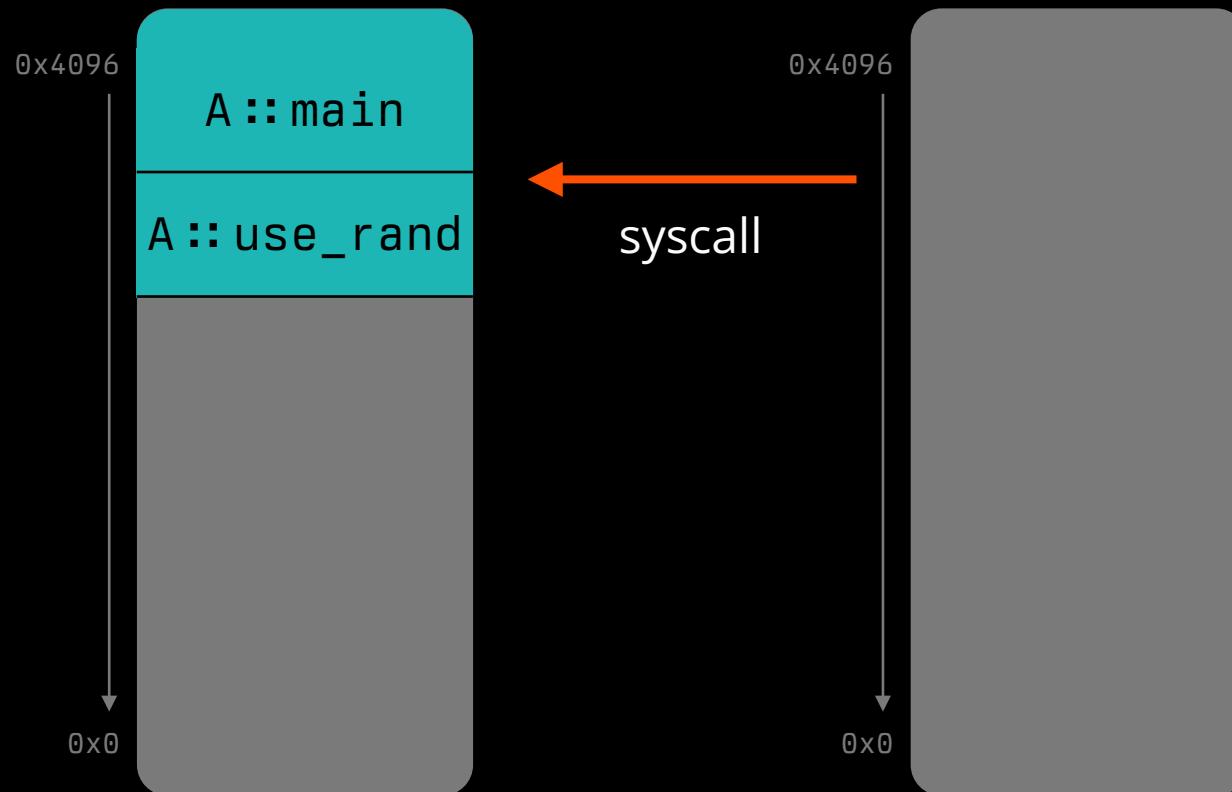


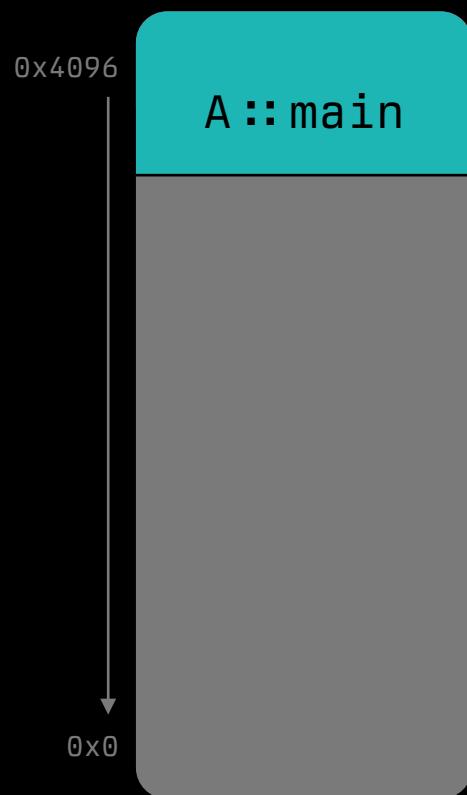
## Example: getrandom(2)



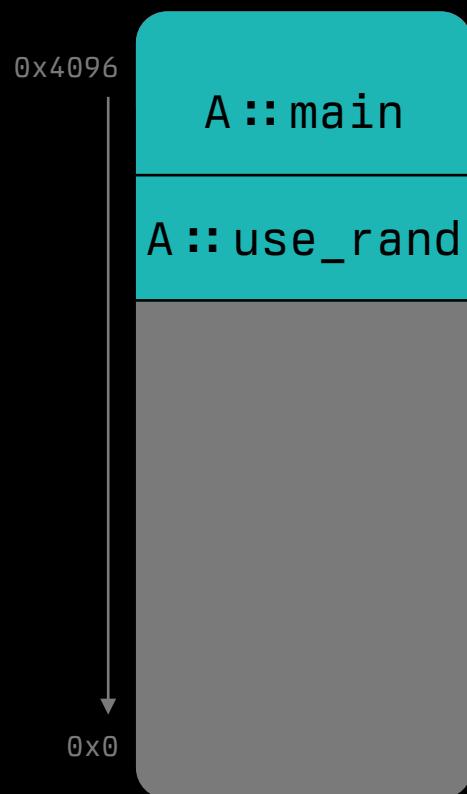
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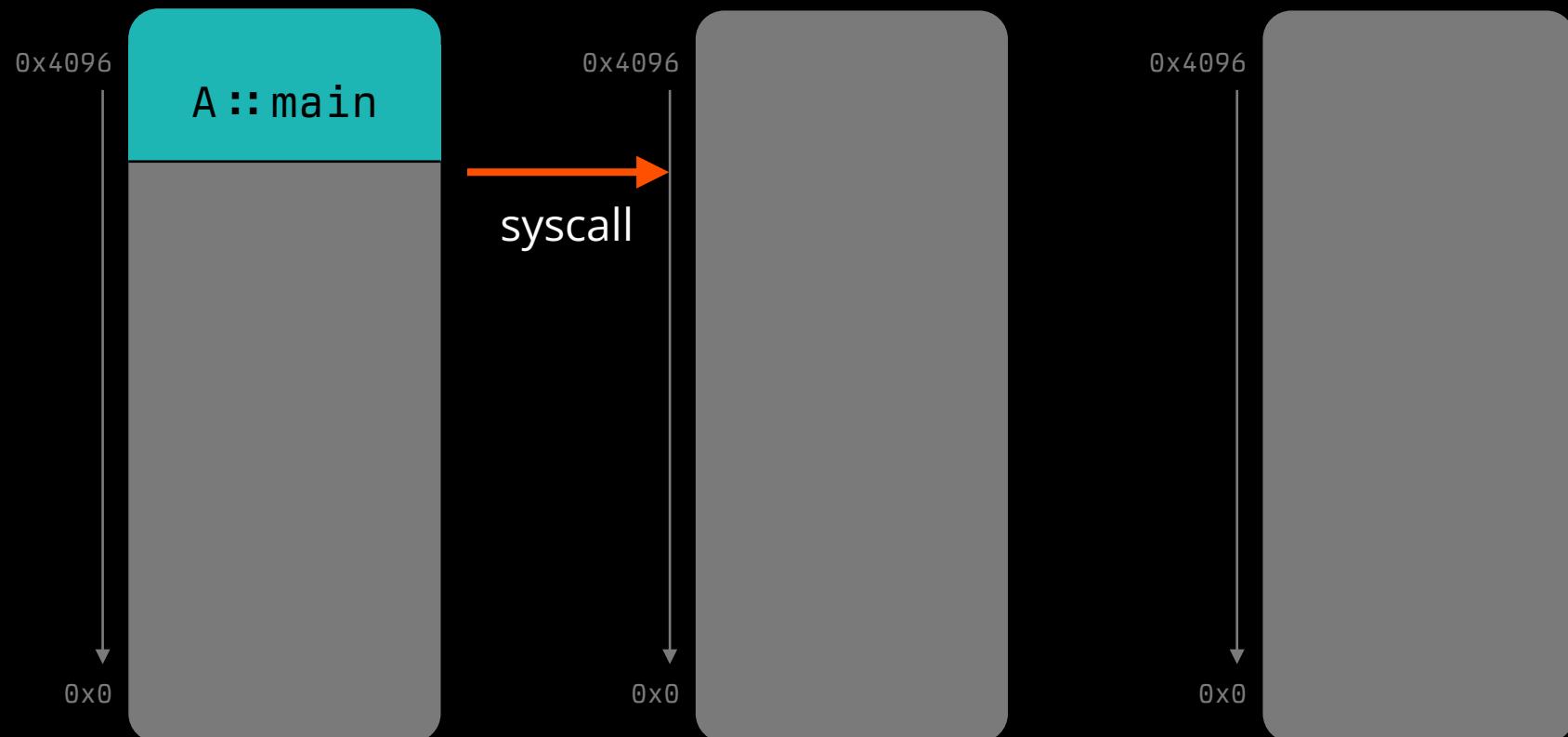


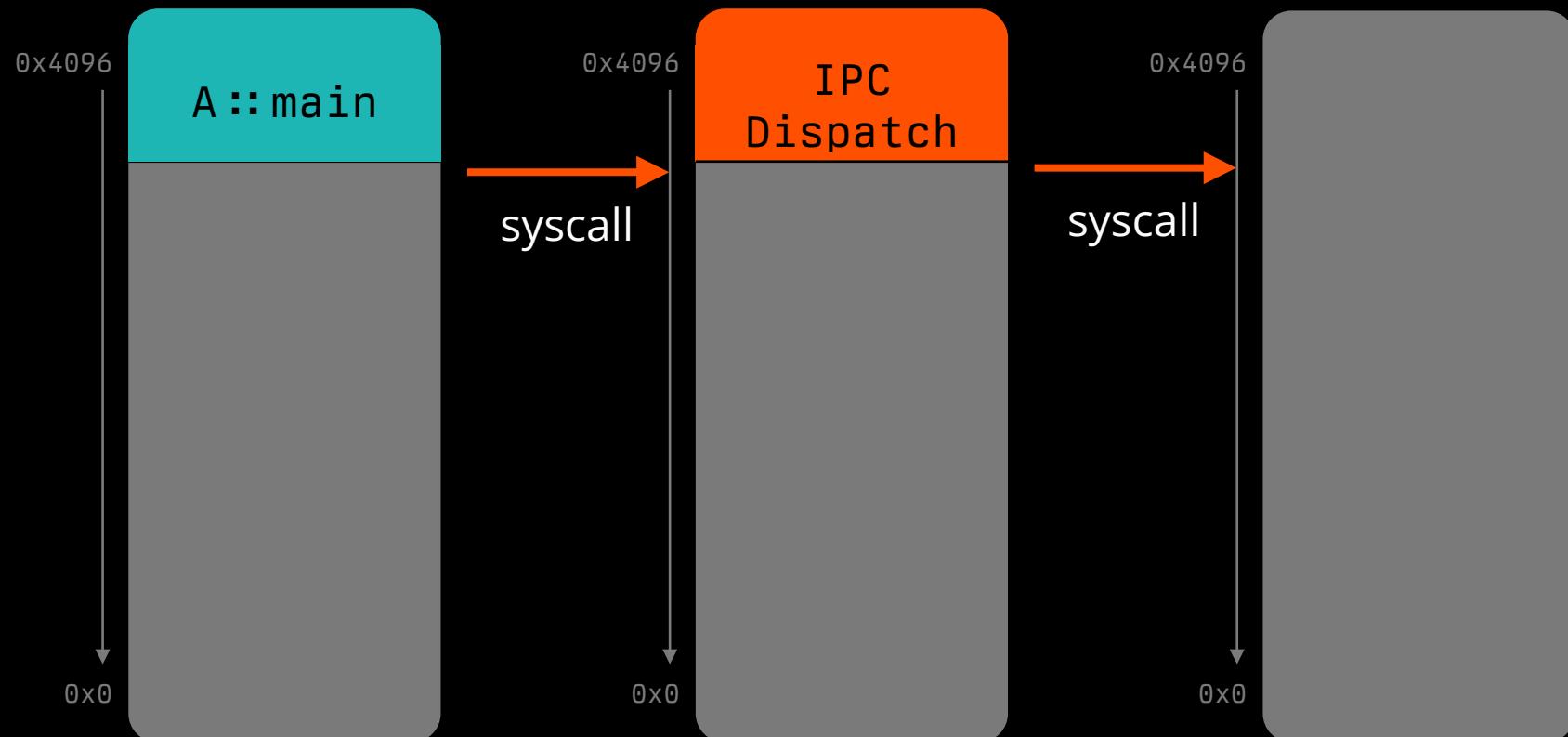


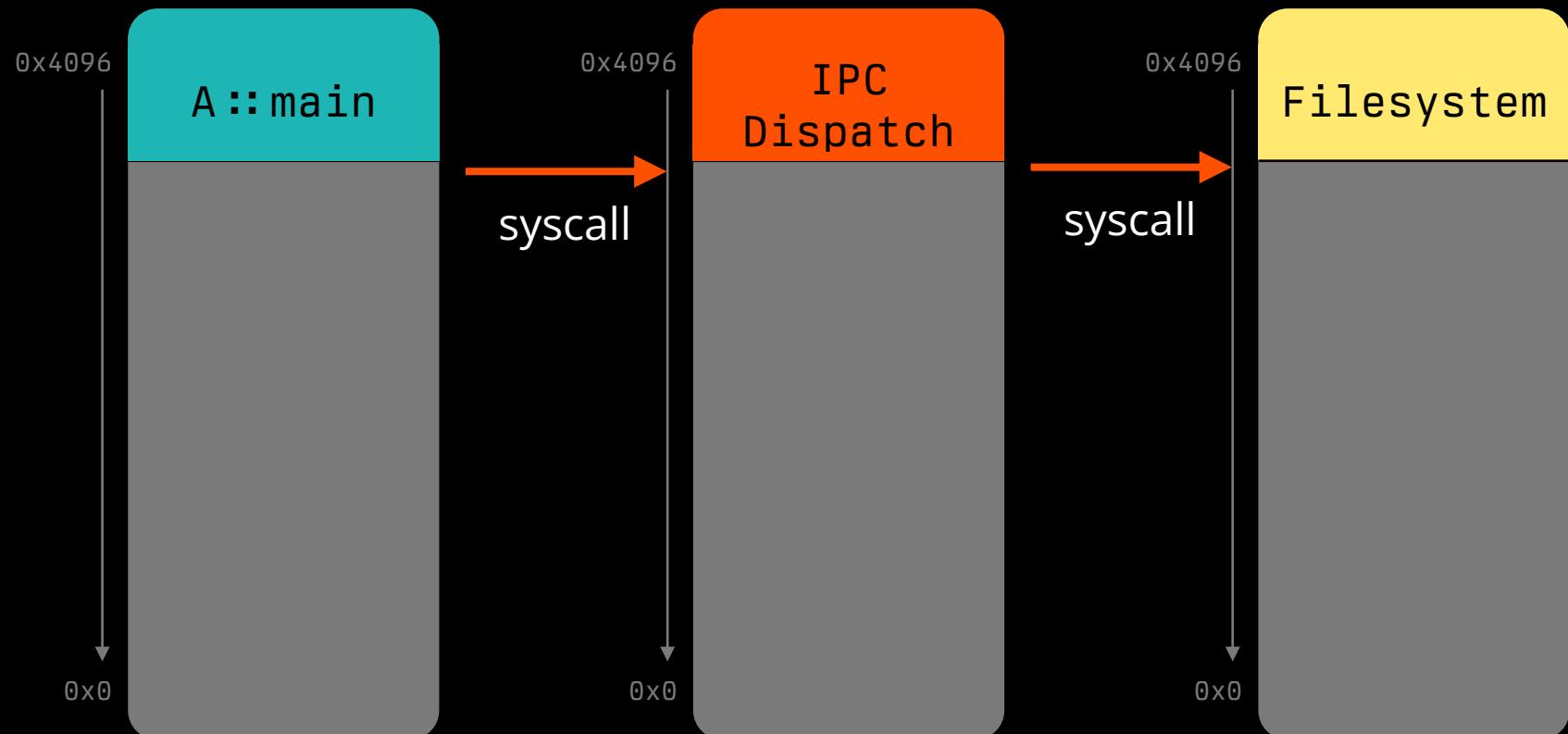


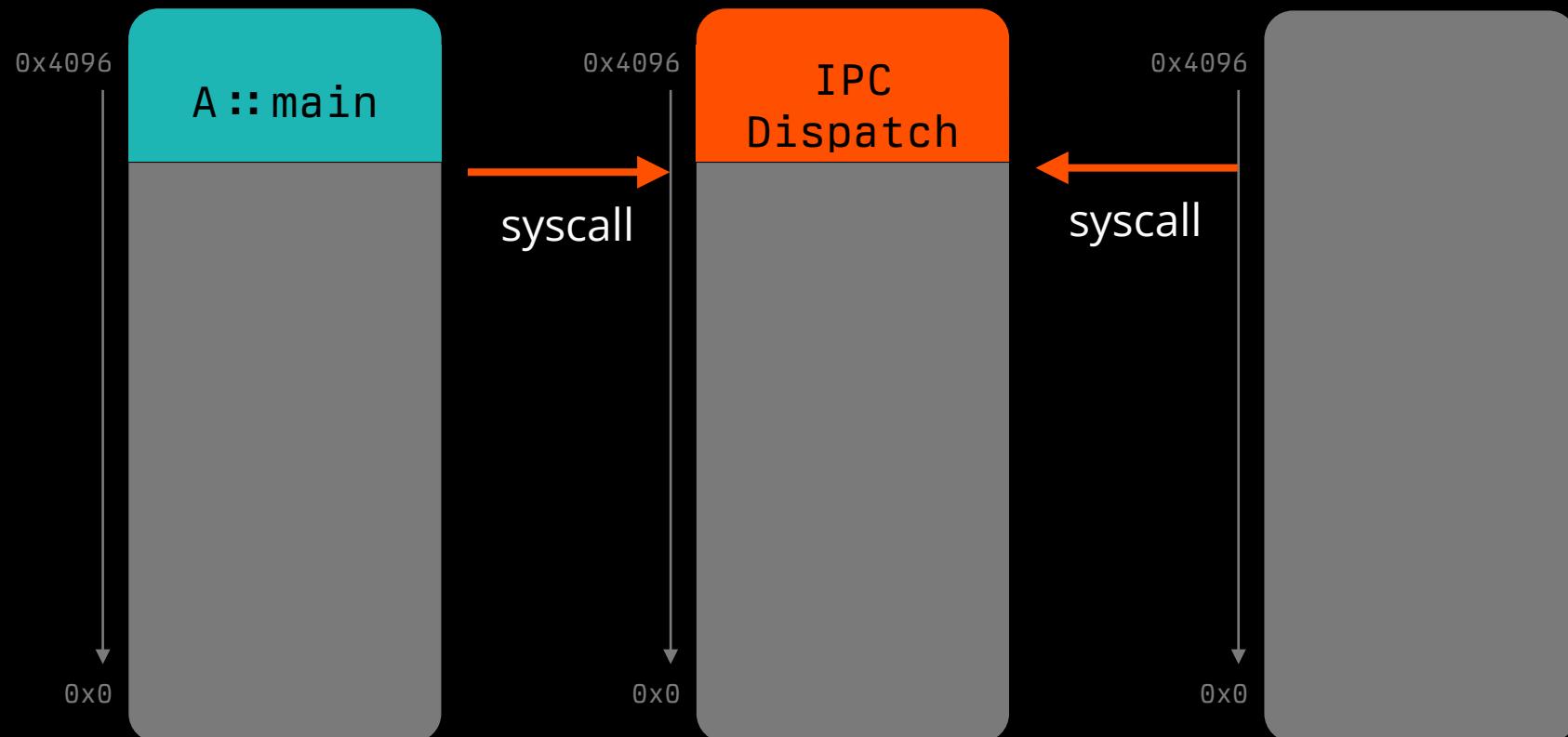


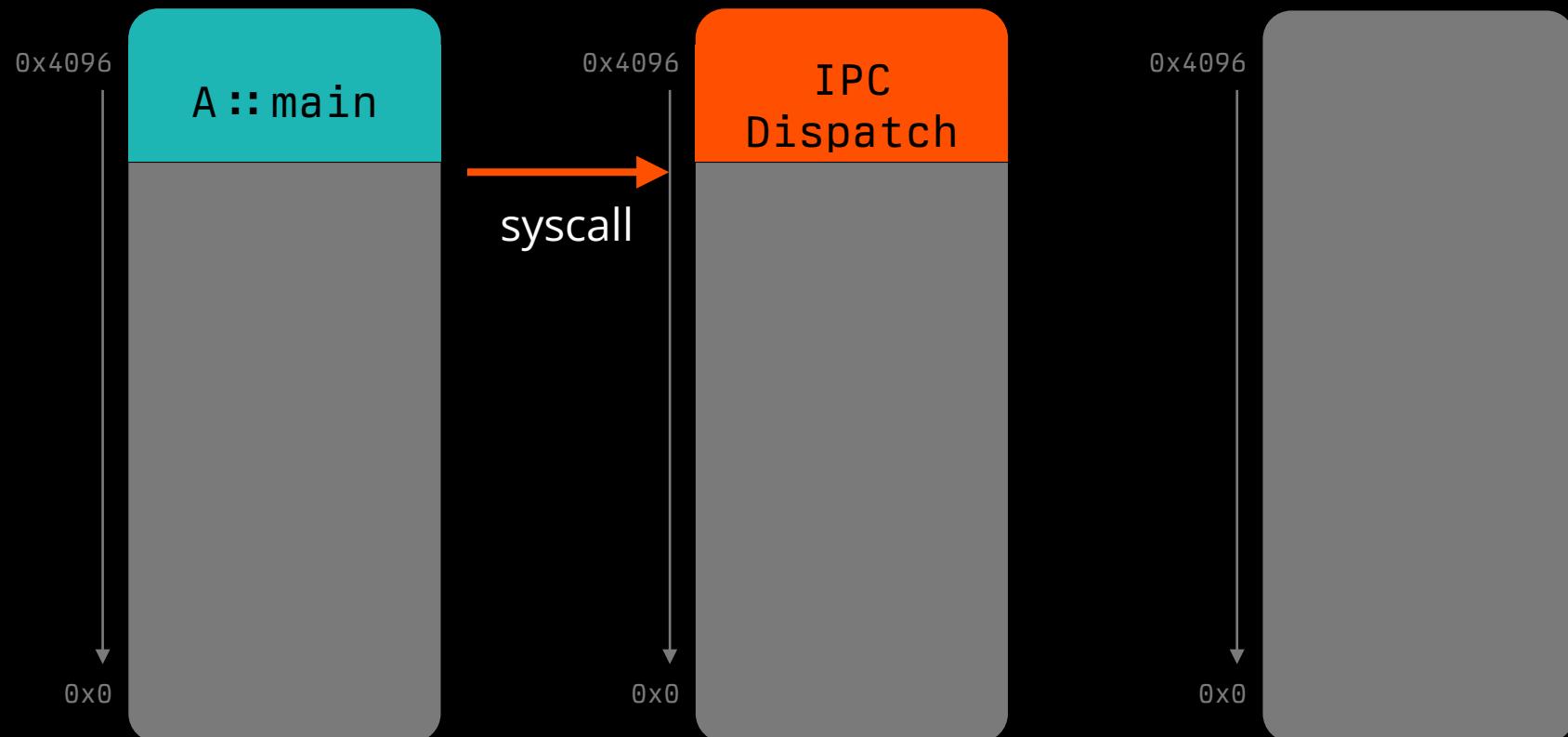


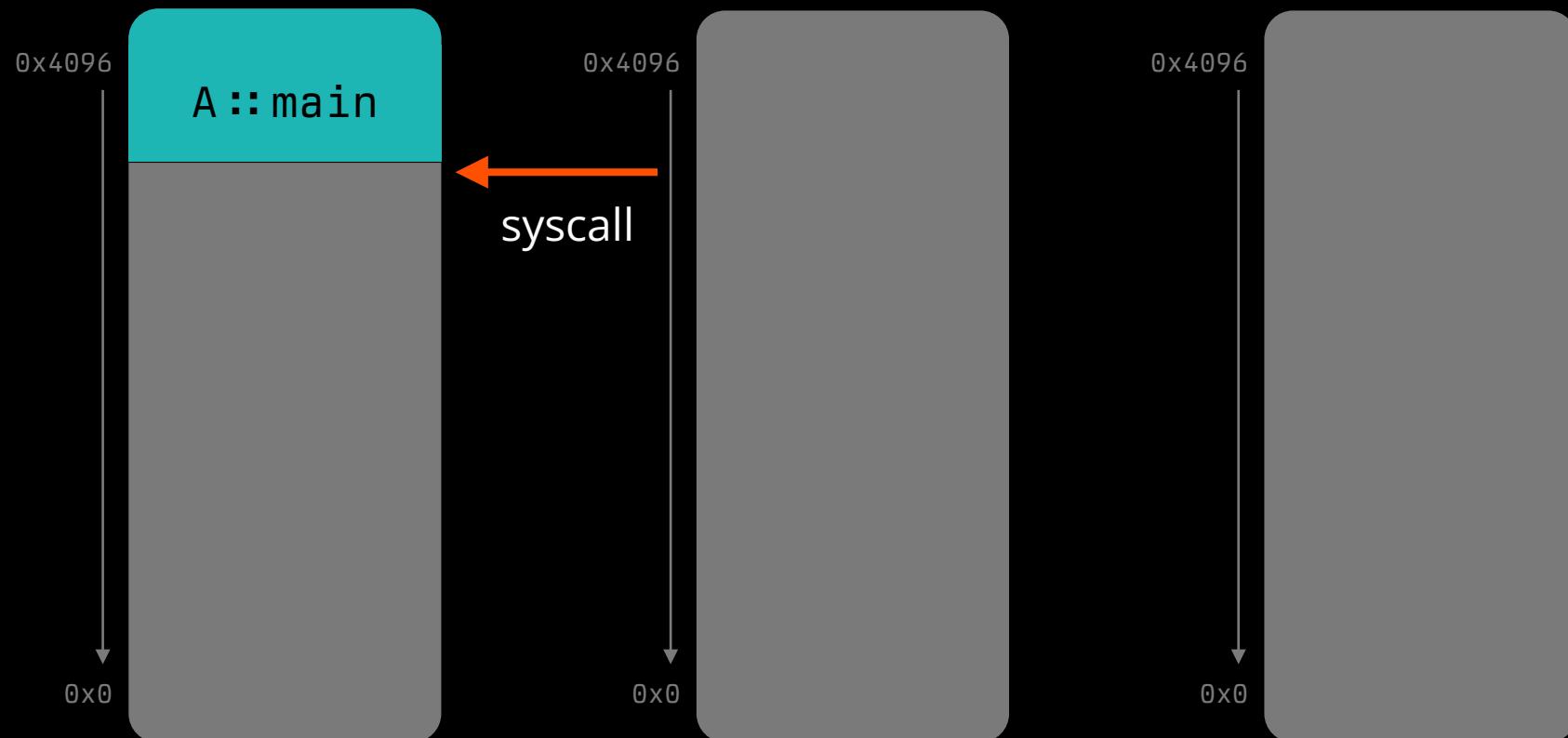


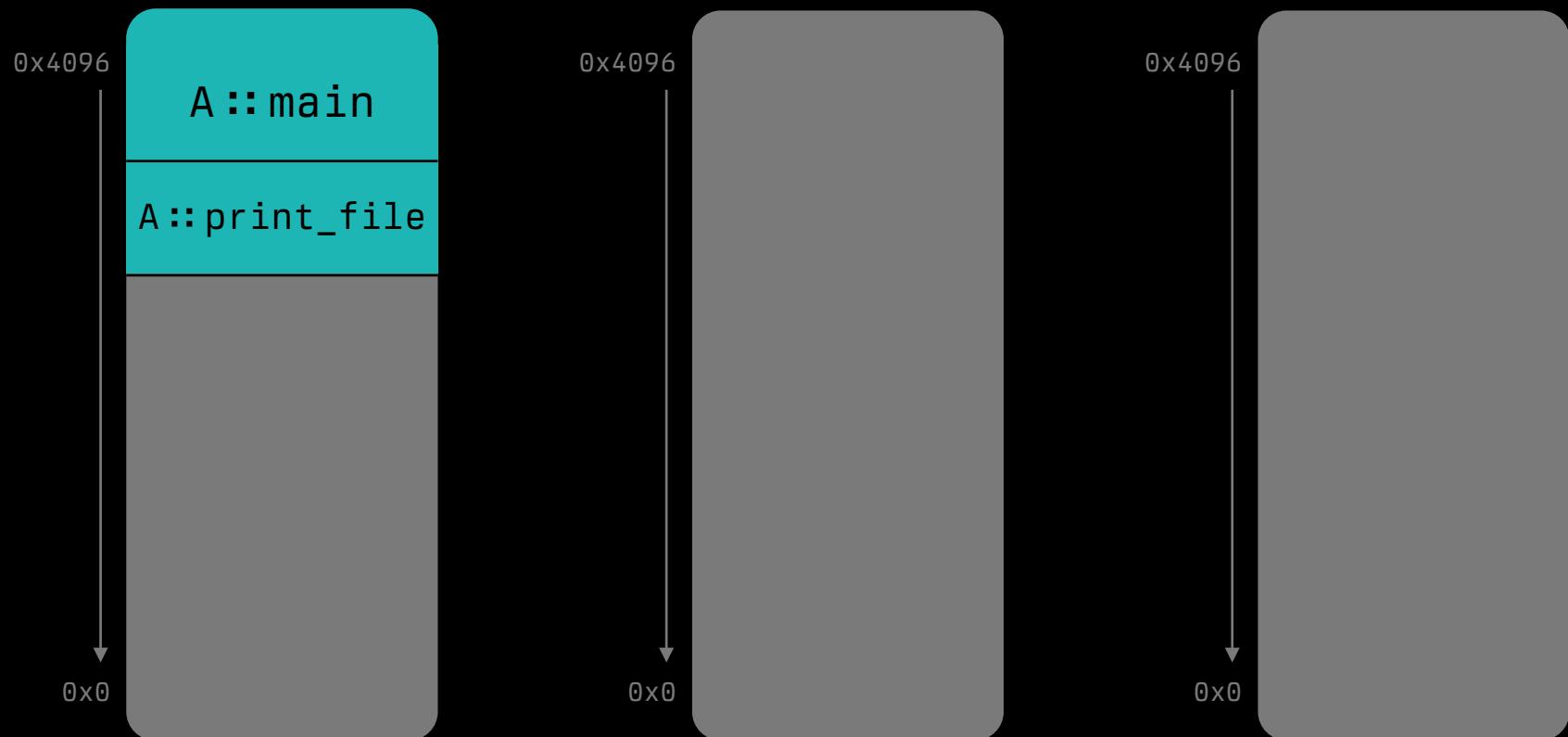


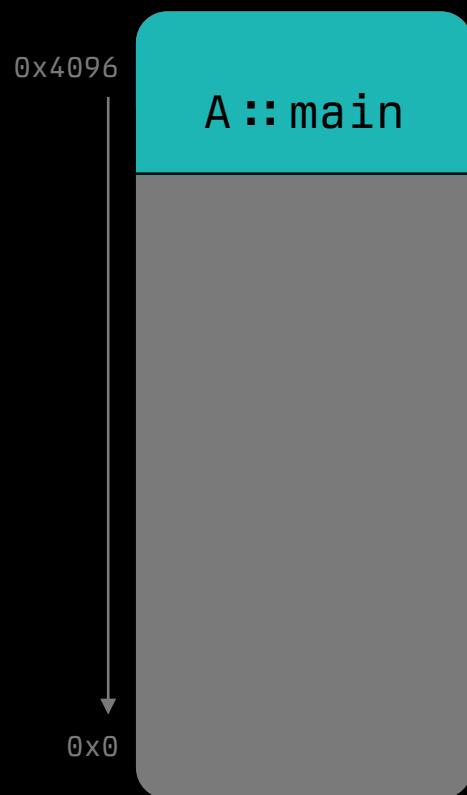


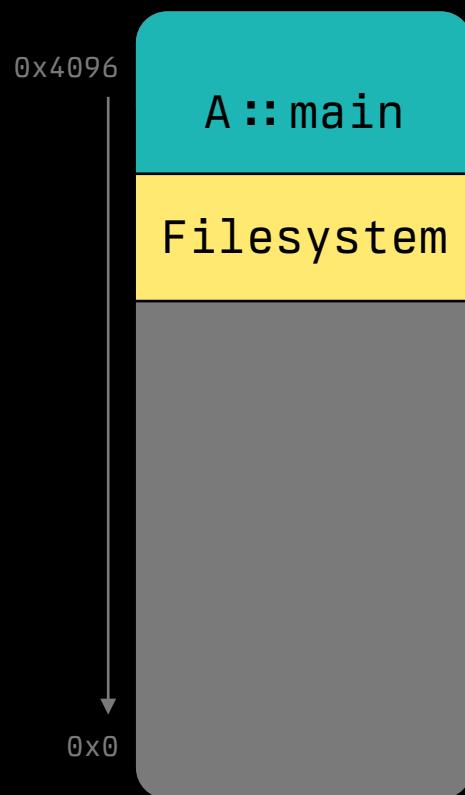


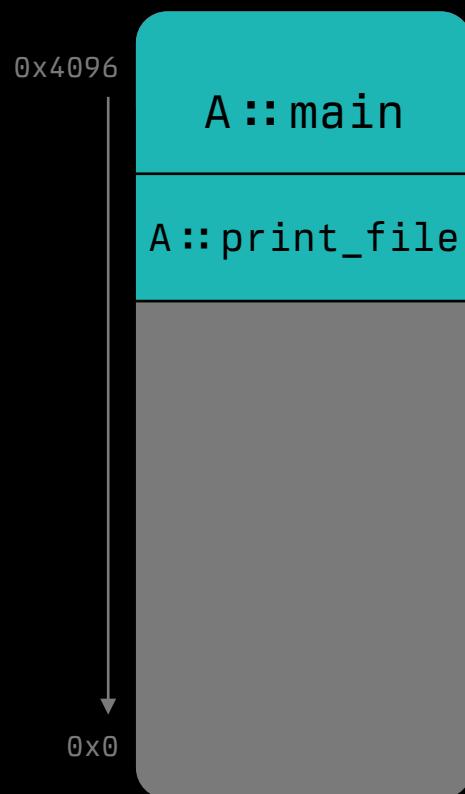


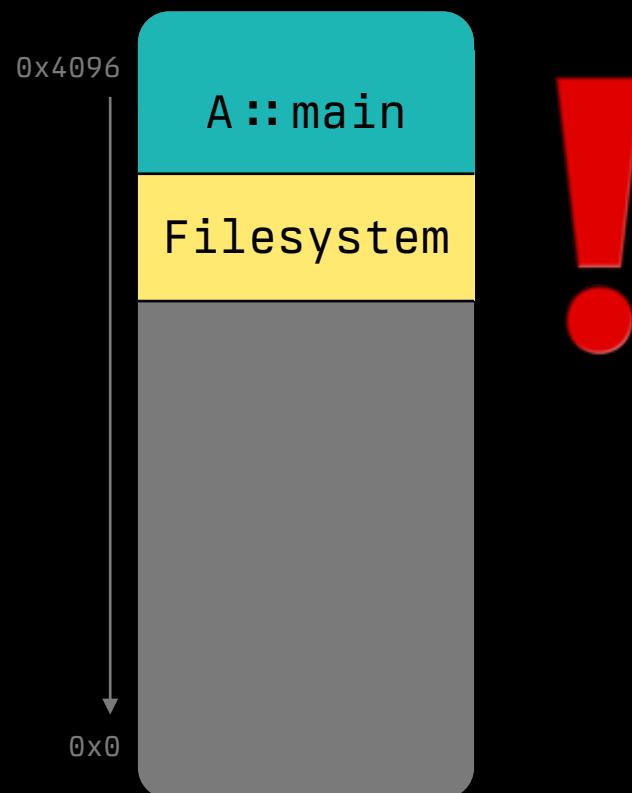














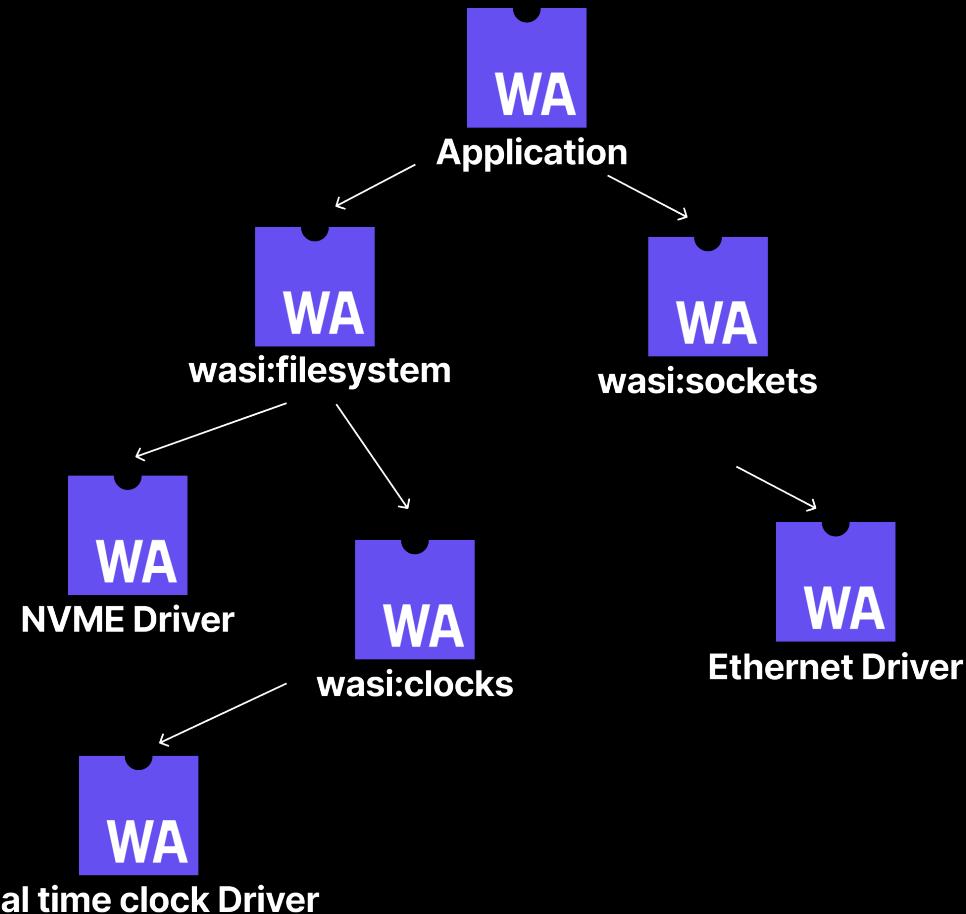
# Component OS

## Structured Compartments

- Composability
- Great for security

## Dependency Management

- NixOS-style
- Reproducible, Reliable
- Only fetch what you need



# The sales pitch

Hire me

[iterpre@protonmail.com](mailto:iterpre@protonmail.com)



more

# Coffee!



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