


can you write a short poem of 4 lines about system level programming



Sure, here's a short poem about system level programming:



 Copy code

```
Beneath the surface, hidden from view  
A world of code, just waiting for you  
To explore and tinker, to build and to create  
Welcome to the world of system level programming, mate
```

I hope you like it! If you want me to make any changes or try a different topic, just let me know. Writing poetry is a creative task, and different people may have different styles and approaches. My poem is just one possible way to approach the topic of system level programming.

**THREADS OR SOMETHING**



**IDK I'M LOST**

**SIZE\_T**

**DANIEL**

**INT**



**A1 + A2 are the easy introductory examples?**



**"MY SANITY IS HANGING ON A THREAD"**



**"A THREAD!"**



**"YOU GET  
IT??? A PTHREAD"**



Making  
memes for  
the coins



Making memes  
to keep yourself  
entertained to  
not lose your  
sanity and break  
under the pressure  
of neverending deadlines

**DOING  
MEMES**



**DOING  
SNP**



**DOING  
MEMES FOR SNP**



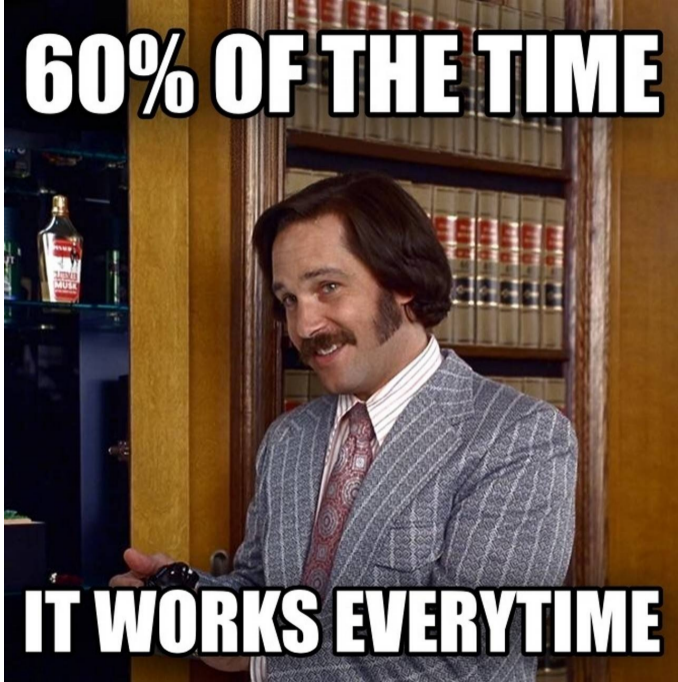
5555 coins for 'Meme and helping others' by lava





**A2 is full of race conditions**

**60% OF THE TIME**



**IT WORKS EVERYTIME**

# Types of Headaches

**Migraine**



**Hypertension**



**Stress**



**Racecondition**





threads

me, trying to  
get A2 working  
without a race-condition

I don't want to play with you anymore

A meme featuring a cartoon character and a sign. The top part shows a pair of hands holding a white sign with the text "YOU HAVE A RACE CONDITION" in bold, black, outlined letters. The bottom part shows a cartoon character with brown hair, wearing a blue and white baseball cap with a blue tree logo, a blue jacket over a red shirt, and a wide, happy smile. He is holding a small white piece of paper. The background is a cartoon town street with buildings and trees.

**YOU HAVE A  
RACE CONDITION**

Woah.

This is worthless!

**ME TRYING TO FIND**

**RACECONDITION THE**

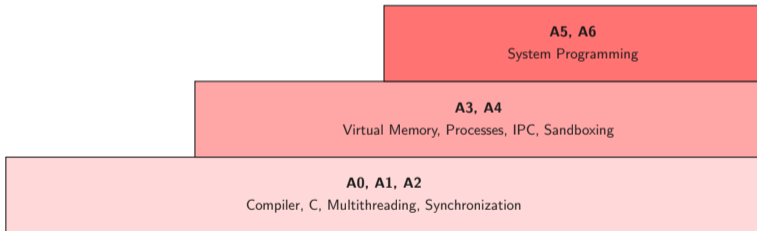


**THERE ARE NO RACE  
CONDITIONS IN MY CODE**

And  
Other Hilarious Jokes  
You Can Tell Yourself

Volume II

# Course Overview





## **A3 - Virtual Memory**

---

**JUST ANSWER A  
FEW QUESTIONS FOR A3**



**THERE ARE OVER  
30 QUESTIONS**





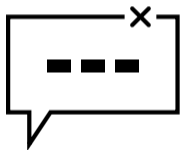
**ANOTHER  
GLOBAL VARIABLE**

**DANIEL**

**GLOBAL  
VARIABLE**

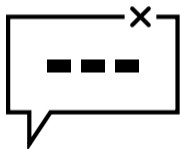


## Segmentation fault



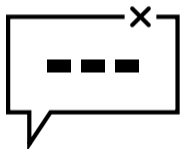
- We've all been there: access to "invalid" memory location

## Segmentation fault



- We've all been there: access to "invalid" memory location
- But aren't pointers indices of this large array called RAM / physical memory?

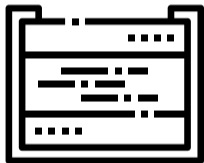
## Segmentation fault



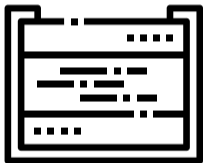
- We've all been there: access to "invalid" memory location
- But aren't pointers indices of this large array called RAM / physical memory?
- How can addresses in physical memory be "invalid"?



- Pointers are not addresses/indices in a large array called RAM / physical memory

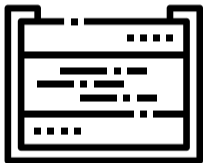


# Virtual Memory



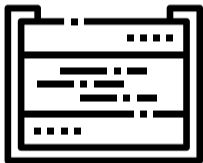
- Pointers are not addresses/indices in a large array called RAM / physical memory
- **but** in a large array called **virtual memory**

# Virtual Memory



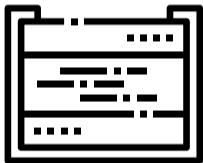
- Pointers are not addresses/indices in a large array called RAM / physical memory
- **but** in a large array called **virtual memory**
- There is a **big map** to translate pointers (virtual addresses) to actual physical addresses

# Virtual Memory



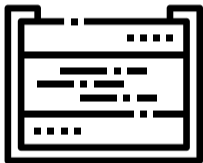
- **Pointers are not addresses/indices in a large array called RAM / physical memory**
- **but** in a large array called **virtual memory**
- There is a **big map** to translate pointers (virtual addresses) to actual physical addresses
- In SLP / as a userspace programmer: we **never** see actual physical addresses - only pointers / virtual addresses!

# Virtual Memory



- **Pointers are not addresses/indices in a large array called RAM / physical memory**
- **but** in a large array called **virtual memory**
- There is a **big map** to translate pointers (virtual addresses) to actual physical addresses
- In SLP / as a userspace programmer: we **never** see actual physical addresses - only pointers / virtual addresses!
- mapping block-wise is easier: mapping a block aka **page**

# Virtual Memory



- **Pointers are not addresses/indices in a large array called RAM / physical memory**
  - **but** in a large array called **virtual memory**
  - There is a **big map** to translate pointers (virtual addresses) to actual physical addresses
  - In SLP / as a userspace programmer: we **never** see actual physical addresses - only pointers / virtual addresses!
  - mapping block-wise is easier: mapping a block aka **page**
- different processes can use the same pointer / virtual address, but “see” different things there

## A3 - Memory Layout and Demand Paging

## A3 - Memory Layout and Demand Paging





## A3 - Memory Layout and Demand Paging



## A3 - Memory Layout and Demand Paging



- Experiment with different kinds of variables, which addresses do they get?

## A3 - Memory Layout and Demand Paging



- Experiment with different kinds of variables, which addresses do they get?
- Observe memory usage in practice, when does it really increase?

## A3 - Memory Layout and Demand Paging



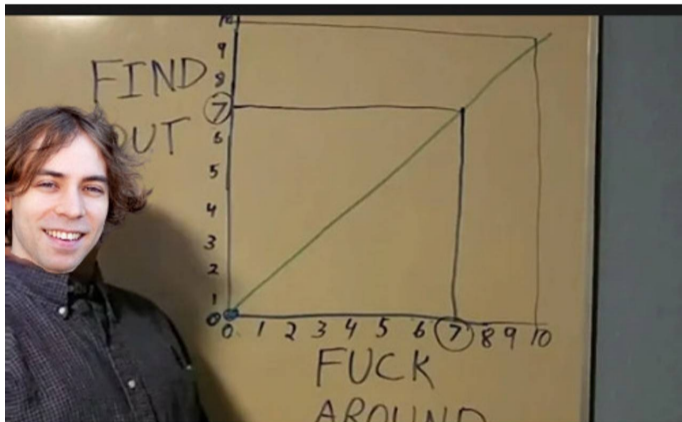
- Experiment with different kinds of variables, which addresses do they get?
- Observe memory usage in practice, when does it really increase?
- **Answer questions from the test system questionnaire!**

## A3 - Memory Layout and Demand Paging



- Experiment with different kinds of variables, which addresses do they get?
- Observe memory usage in practice, when does it really increase?
- **Answer questions from the test system questionnaire!**
- **Register + participate in one of the virtual memory discussions!**

# SLP in a nutshell



the more you fuck around  
the more you're gonna find out

## A3 - Changes due to Virtual Setting

## A3 - Changes due to Virtual Setting





## A3 - Changes due to Virtual Setting



## A3 - Changes due to Virtual Setting

- How to proceed? (if you ignore this you won't be able to answer all of A3)



## A3 - Changes due to Virtual Setting



- How to proceed? (if you ignore this you won't be able to answer all of A3)
- Answer **all** questions, question by question

## A3 - Changes due to Virtual Setting



- How to proceed? (if you ignore this you won't be able to answer all of A3)
- Answer **all** questions, question by question
- “I guessed correctly” → not sufficient

## A3 - Changes due to Virtual Setting



- How to proceed? (if you ignore this you won't be able to answer all of A3)
- Answer **all** questions, question by question
- “I guessed correctly” → not sufficient
- “I read online that this is the answer” → not sufficient

## A3 - Changes due to Virtual Setting



- How to proceed? (if you ignore this you won't be able to answer all of A3)
- Answer **all** questions, question by question
- “I guessed correctly” → not sufficient
- “I read online that this is the answer” → not sufficient
- We want a full explanation for the answer and **what I have to do to observe the behavior you describe**

## A3 - Changes due to Virtual Setting



- How to proceed? (if you ignore this you won't be able to answer all of A3)
- Answer **all** questions, question by question
- “I guessed correctly” → not sufficient
- “I read online that this is the answer” → not sufficient
- We want a full explanation for the answer and **what I have to do to observe the behavior you describe**
- Don't collaborate with others - we cross check who did what when, answered which question when, etc.