Tacos Overview & Lab0 Intro

TA Session

TA: Peng Zijun(彭子隽)
Email: 2200012909@stu.pke.edu.cn
Github: OshinoShinobu-Chan

TACOS

RUST OS NEVER GETS RUSTY.

Deadlines

- Lab 0 Code will be due next Thursday 11:59 pm
- Lab 0 Design Doc will due next Sunday 11:59 pm
- **Start early, because you never know what will happen.**

What is Tacos

- ~~A taco is a traditional Mexican dish~~

- Tacos is an educational operating system developed fully in Rust for RISC-V platforms

- So, what is Rust, what is RISC-V?

What is Rust

- ~~Rust is the best programming l~~

- A language empowering every ent software.

- Fast, reliable, productive.

- Inspired by many other langua

What is Rust

- System programming in Rust is a trend.
- Rust has been used in Linux kernel. (Rust for Linux)
- How to learn rust: *The Rust Programming Language*

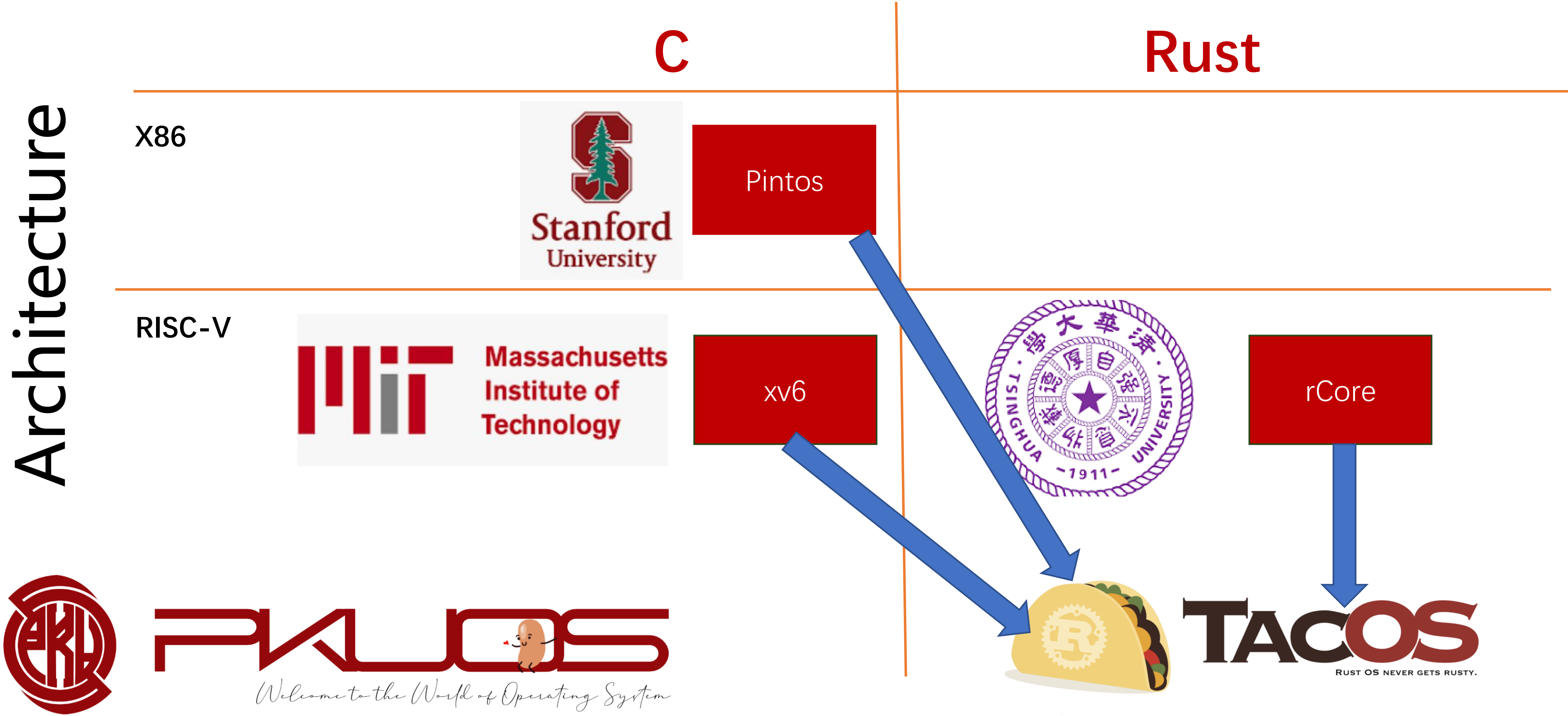
Next several slides is from last year TA's slides…

RISC-V is:

- ~~A RISC ISA~~
- from UC Berkeley
- was originally designed to support computer architecture research and education
- now will also become a standard free and open architecture for industry implementations.

Educational OSs

Programming Language



C

Rust

Architecture

X86

Stanford University

Pintos

RISC-V

Massachusetts Institute of Technology

xv6

TSINGHUA UNIVERSITY 1911

rCore

PKUOS

Welcome to the World of Operating System

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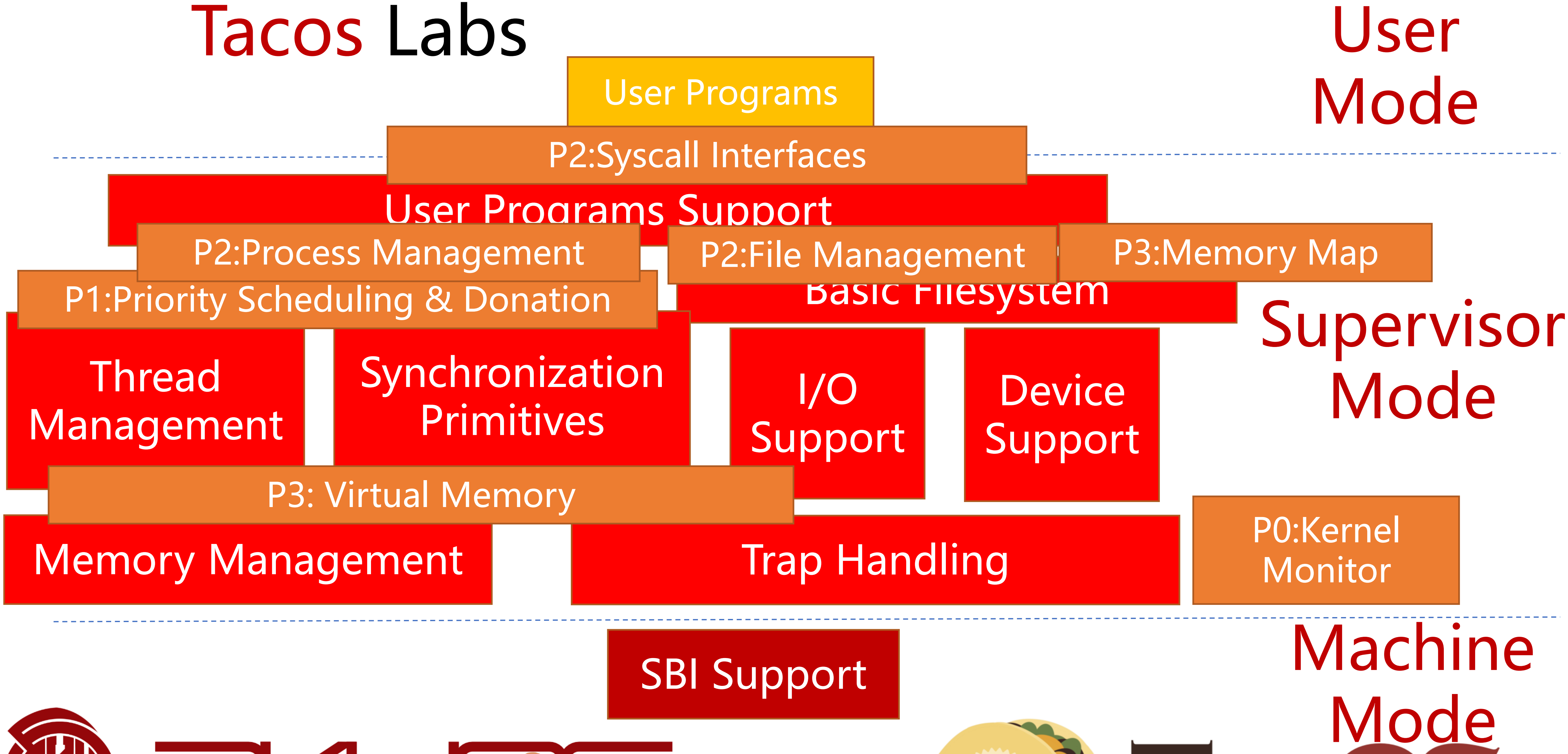
Tacos Labs



User Mode

User Programs

P2:Syscall Interfaces

User Programs Support

P2:Process Management

P2:File Management

P3:Memory Map

P1:Priority Scheduling & Donation

Basic Filesystem

Supervisor Mode

Thread Management

Synchronization Primitives

I/O Support

Device Support

P3: Virtual Memory

Memory Management

Trap Handling

P0:Kernel Monitor

Machine Mode

SBI Support

Welcome to the World of Operating System

Rust OS never gets rusty.

Tacos is:

- an operating system developed fully in Rust for RISC-V platforms
- is designed to be modular
- has 4 challenging labs
- in active development! Welcome to join!

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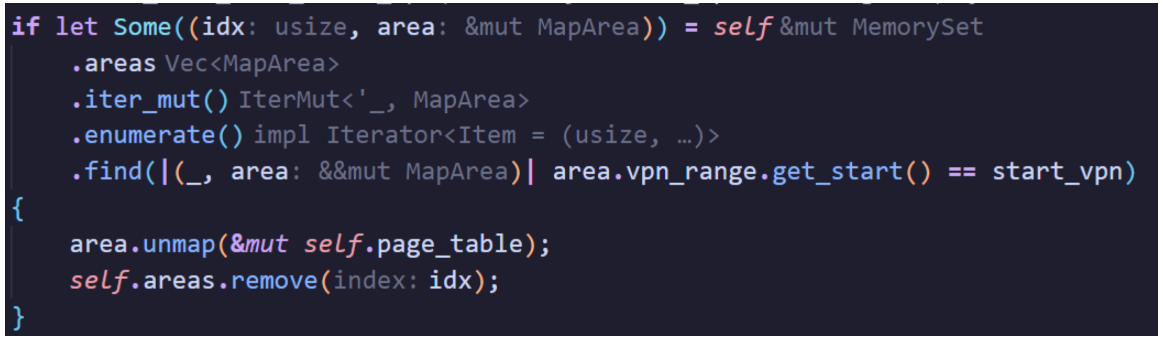
Tacos or Pintos

Vote for Tacos

- Rust is a beautiful language.
  - It has many useful modern features, like trait, Result, Option……
  - It has functional programming support. So you can use things like closure.
  - Rules like ownership and lifecycle helps you avoid bugs related to pointers.
    - However, it **won't** reduce the complexity. It just forces you to make better design before getting start.



```
if let Some((idx: usize, area: &mut MapArea)) = self &mut MemorySet
    .areas Vec<MapArea>
    .iter_mut() IterMut<'_, MapArea>
    .enumerate() impl Iterator<Item = (usize, …)>
    .find(|(_, area: &&mut MapArea)| area.vpn_range.get_start() == start_vpn)
{
    area.unmap(&mut self.page_table);
    self.areas.remove(index: idx);
}
```

Tacos or Pintos

Vote for Tacos

- **RISC-V** is a modern ISA
  - Do not need to deal with legacies

- **Tacos** is born at PKU
  - You will have a detailed walkthrough of how Tacos is written from scratch.
  - If you have better designs, and want to change/rewrite components in **Tacos**, you will receive immediate help!

- rCore is also Rust+RISC-V, you can take look at it.

Rust OS never gets rusty.

Tacos or Pintos

Vote against Tacos

- RISC-V and Rust is too modern
  - Potential bugs in compiler/emulator/toolchain.
    - I've been experienced a funny bug in Rust Analyzer.

- You have learnt x86 in ICS, but RISC-V is a new ISA for you.
  - There's totally different instructions.
  - You have to take some time to be familiar with RISC-V

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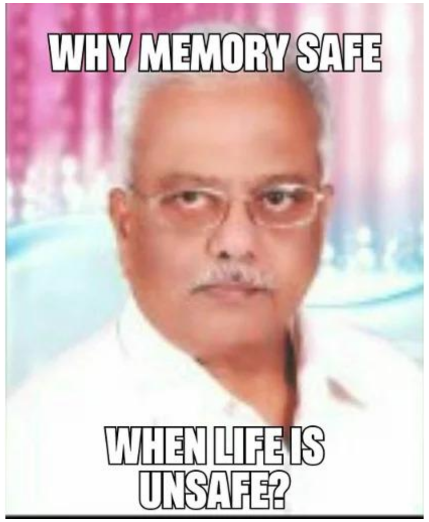
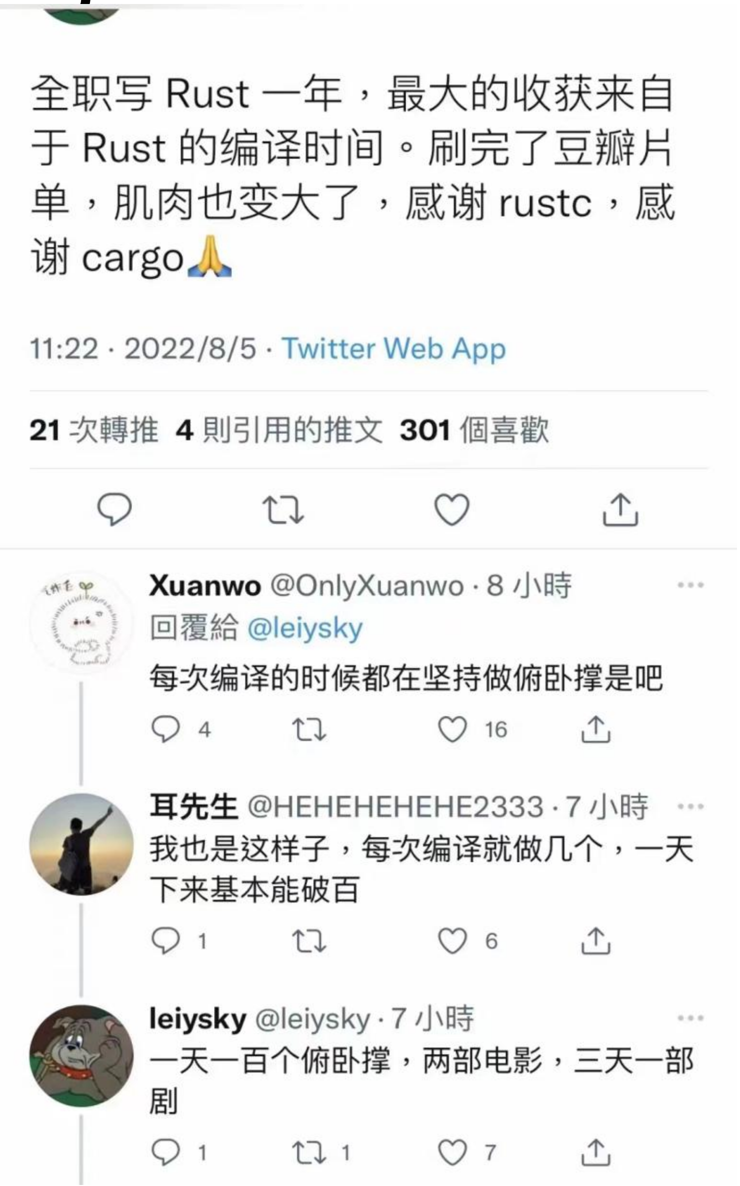
Tacos or Pintos

- Rust compiler:
  - Compiles slowly.
  - Some rules are too strict.
    - `unsafe` and raw pointers may become your friends
- Rust is hard to learn.
- **Tacos** is in developing
  - The document is not as elaborate as Pintos
  - Potential bugs



Vote against Tacos



全职写 Rust 一年，最大的收获来自于 Rust 的编译时间。刷完了豆瓣片单，肌肉也变大了，感谢 rustc，感谢 cargo🙏

11:22 · 2022/8/5 · Twitter Web App

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4 16

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我也是这样子，每次编译就做几个，一天下来基本能破百
1 6

leiysky @leiysky · 7 小時
一天一百个俯卧撑，两部电影，三天一部剧
1 1 7

Setting up environment

- Following the documentation.

- The best way is using docker and dev container plugin.

- If you're computer is not x86, like Apple M-series chips, you may find Tacos is very slow. In this case, using clab will be a good idea.

Setting up environment

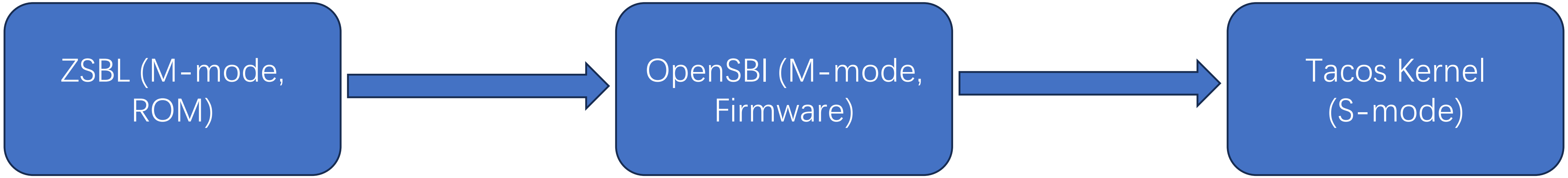
- You may meet some problem pulling docker image due to some reasons.
  - If you are using clab,
    - Install docker on your PC and clab. (STFW)
    - Pull the docker image (crimmypeng/tacos:rust-1.92v3) on your PC first.
    - Use ``` **docker save -o tacos.tar** ``` to save the image
    - Use scp or other methods to upload **tacos.tar** to your server
    - Use ``` **docker load -I tacos.tar** ``` to load the image to your docker in clab.

What’s new this year

- We update the rust version of Tacos from 1.70 to 1.92
- We provide a remote test server. The address is www.crimmy.top:14001. For more details, please check the documentation.

Lab0 Intro

- GDB
- Tacos booting process



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Other suggestions

- When you use git, you can also create a **private repository** on github.
  - If something goes wrong on your computer or clab, you can have a backup.
  - Be careful with AI Agent. They may run dangerous command without your permission.
- AI may be your friend.
  - But don’t rely fully on copilot to write your code. They are **not always reliable** when implementing **Tacos**.

- Read code in **Tacos**.

TacOS

Rust OS never gets rusty.