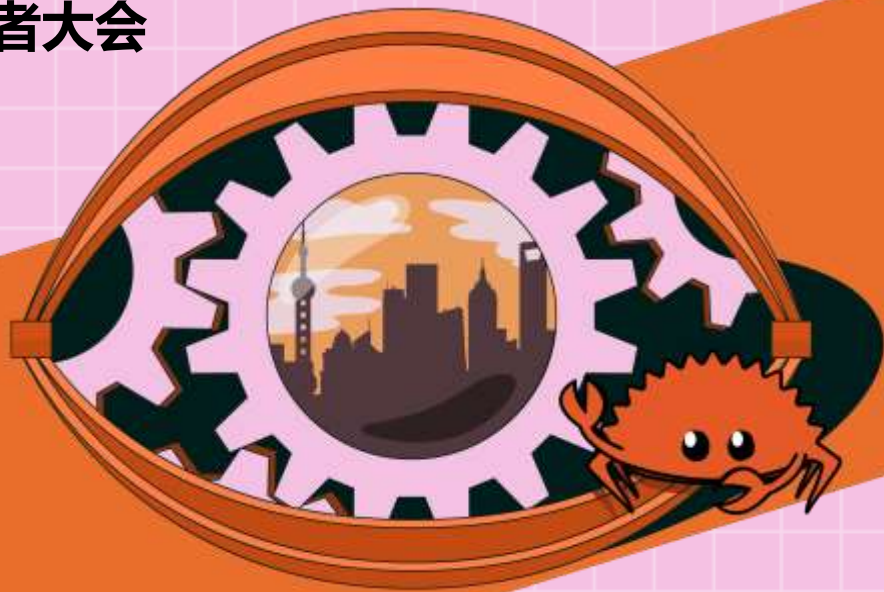


RUST CHINA CONF 2023

第三届中国Rust开发者大会



6.17-6.18 @Shanghai

Building Linux Distribution from Scratch with Rust

Speaker: Jia Xiaoyu





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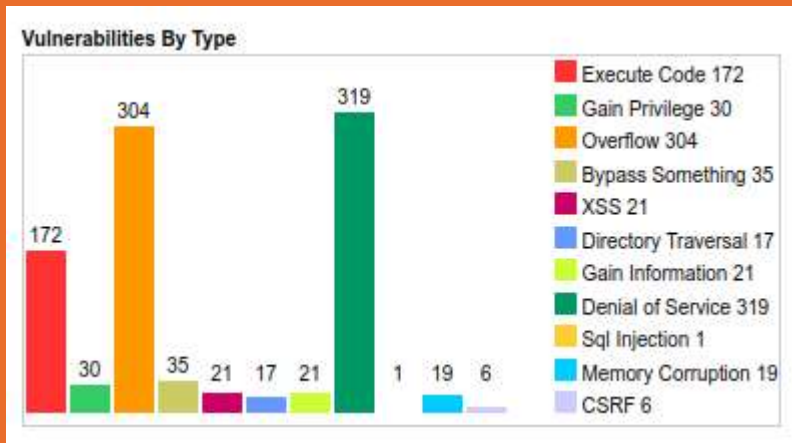
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Why do we choose Rust?



Why do we choose rust?



The number of vulnerabilities by type in the GNU since 1999 (data from: CVE Details)

Why do we want to use Rust to build most of the things in the Operating system?

1. If you have a very large (millions of lines of code) codebase, written in a memory-unsafe programming language (such as C or C++), you can expect at least 65% of your security vulnerabilities to be caused by memory unsafety.
2. Security issues can happen not only in the kernel, but also in the whole system, which includes the kernel and the system software.

■ Why do we choose rust?

What rust-related things have happened in the kernel since the release of kernel 6.1?

- Linux 6.1: Officially Adds Support for Rust in the Kernel
 - Kernel internals (kallsyms expansion for Rust symbols, %pA format)
 - Kbuild infrastructure (Rust build rules and support scripts)
 - Rust crates and bindings for initial minimum viable build
 - Rust kernel documentation and samples
- Possible to create "hello world" module

■ Why do we choose rust?

Linux 6.1~Linux 6.4 :

What are the important updates?

- Linux 6.2:
 - New : #vtable, declare_err!(),dbg!
- Linux 6.3:
 - New : Some new type,new trait and 'alloc' crate remove 'borrow' module
- Linux 6.4:
 - New : pin-init API

Using Rust and LFS build linux distro



■ Using Rust and LFS build linux distro

How to build rust support Kernel?

- Require:
 - rustc,rust-src(cross-compile core and alloc),rust-bindgen
 - llvm(clang)
 - make LLVM=1 rustavailable
 - make CC=clang rustavailable
- Compile kernel
 - make LLVM=1(CC=clang) rustavailable
 - enable Rust support in the General setup
- Other thing
 - gccrs in development
- Happing Hacking



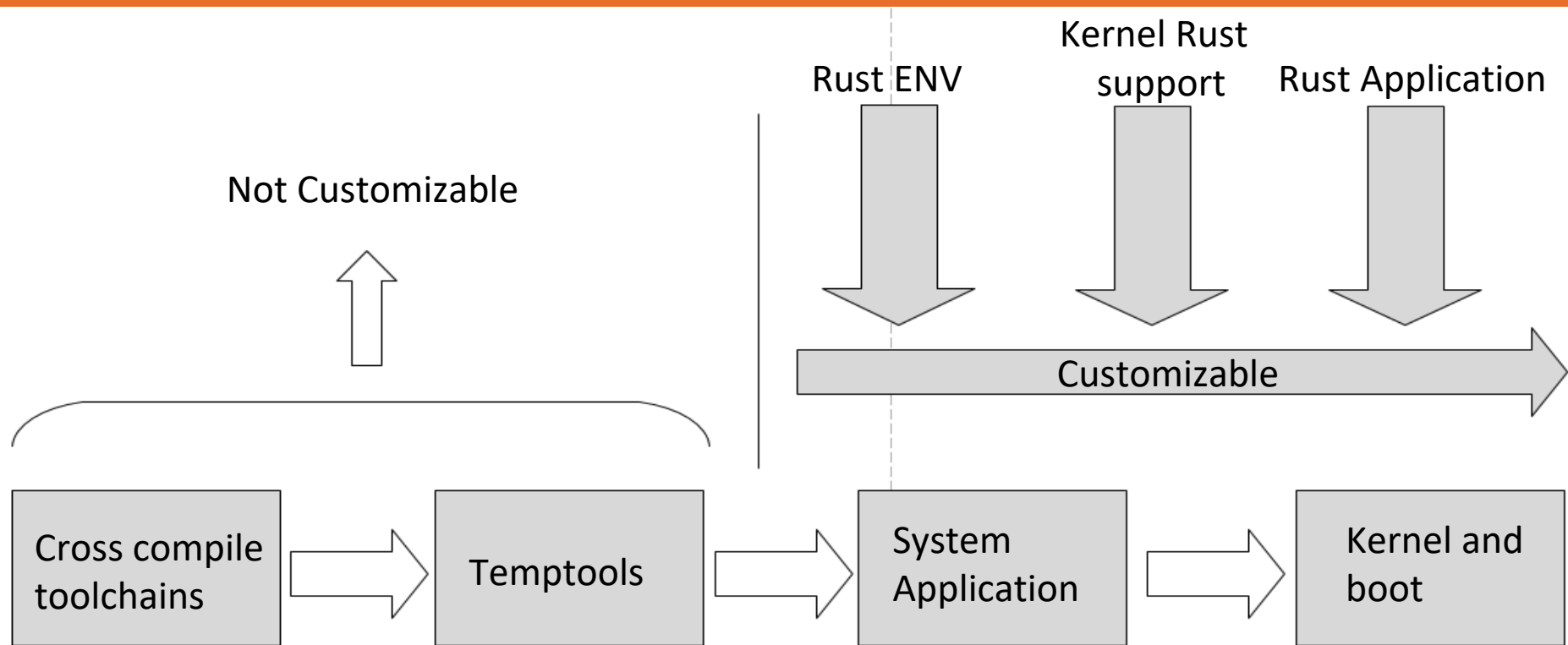
Using Rust and LFS build linux distro

Benefits of using LFS to build linux distributions

- What is LFS?
 - Linux From Scratch(LFS) is a project that provides you with step-by-step instructions for building your own custom Linux system, entirely from source code.
- Benefits:
 - highly customizable
 - lightweight
 - full control
- Steps:
 - Preparing for the Build
 - Build Cross Toolchain and Temporary Tools
 - Build Basic System Software(73)
 - System Configuration
 - Make it bootable



Using Rust and LFS build linux distro



■ Using Rust and LFS build linux distro

Challenges of using LFS to build linux distributions

1. A lot of time and effort, as well as a certain level of technical skill and experience.
2. Regular manual maintenance of the system, to keep the software and the kernel up to date.
3. Solving compatibility or dependency issues that may arise during the compilation process.

Using Rust and LFS build linux distro

```
dagrs:
  a:
    name: "Task1"
    after: [b]
    run:
      type: sh
      script: echo > . /test/test_value_pass1.txt
  b:
    name: "Task2"
    run:
      type: deno
      script: let a = 1+4; a*2
```

```
struct T1 {}

impl TaskTrait for T1 {
  fn run(&self, _input: Input, _env: EnvVar) -> Output {
    let hello_dagrs = String::from("Hello Dagrs!");
    Output::new(hello_dagrs)
  }
}
```

Automake the build process using the rust language

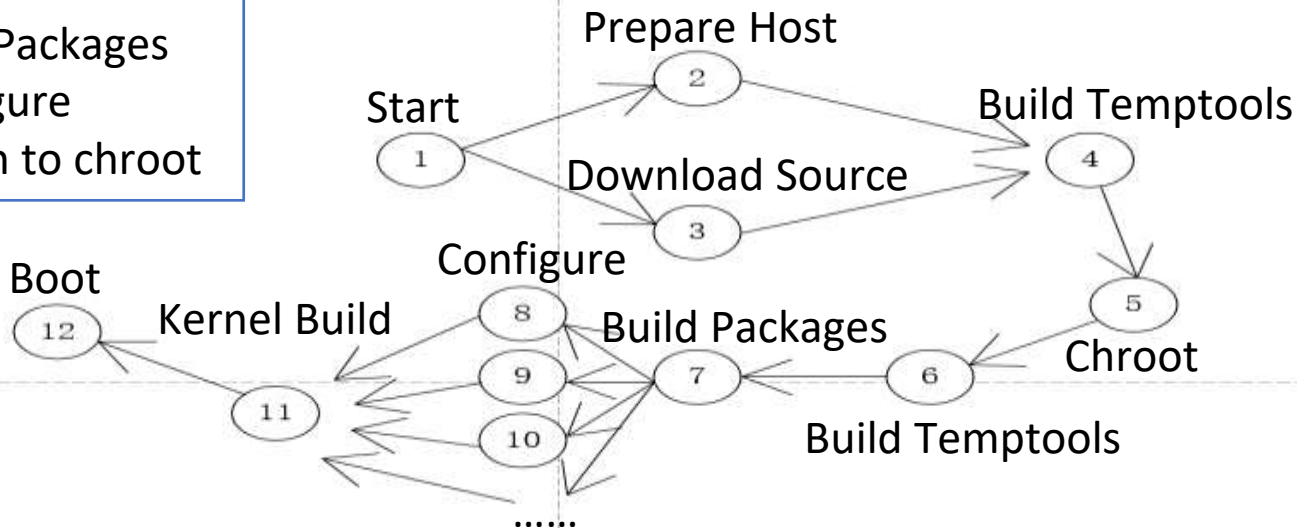
dagrs : DAG execution engine is a high-performance multi-task execution engine.

Using Rust and LFS build linux distro

Automake the build process using the rust language

Nodes:

Build Packages
Configure
Switch to chroot



What rkos brings us?



■ What rkos brings us?

Rust kernel programming

.....

More system application with rust

1. utils coreutils: a cross-platform reimplement of the gnu coreutils in Rust
2. ripgrep: ripgrep is faster than {grep, ag,glt,grep,ucg,pt,sift}
3. sudo-rs: A safety oriented and memory safe implementation of sudo and su written in Rust
4. ntpd-rs: ntpd is an NTP implementation written in Rust,with a focus on security and stability
5. Trust-DNS:A Rust based DNS client, server,and Resolver,built to be safe and secure from the ground up.
6.

What rkos bings us?

utils/coreutils



What rkos brings us?

Planing

1. Wait for the stable release of dagrs, and then refactor rkos-builder.
2. The focus will be on building a clean and reliable foundation environment.
3. Support more applications developed by Rust.

Thank you!

