

# Packaging a new toolchain

Angus Lees <[gus@debian.org](mailto:gus@debian.org)>

# Rust!

- New programming language
- In the C/C++ end of town
- Built on LLVM
- Very close to Rust 1.0 release
- Rust compiler is written in Rust
  - **Circular build dependency!**

# Challenges

- Bootstrapping the first package
- Bootstrapping new architectures
- `x86_64-linux-gnu != x86_64-unknown-linux-gnu`
- Rust is still a fast moving language
  - Need very narrow version of rustc to build next rustc

# Compiler stages

## stage0

Pre-existing compiler used to build stage1

## stage1

Minimal compiler (no libraries, etc) used to build stage2

## stage2

Full compiler used to build stage3

## stage3

Full compiler distributed to users (ideally identical to stage2)

# Bootstrapping the first package

Rust is usually built using a stage0 binary downloaded during the build process. Yuck.

No way around it - must be built using an existing Rust compiler built “somehow.”


# Whither stage0?

- Download during build
- Bundle pre-built stage0 in Debian source package
- Use previous rustc package and iterate as often as required

# Bootstrapping: The first package

## debian/control

```
Source: rust
Build-Depends: rustc
Package: rustc
```



```
Source: rust
Build-Depends:
  rustc <!stage1> | rustc-bootstrap <!stage1>
Package: rustc
Package: rustc-bootstrap
```

## dpkg-buildpackage -Pstage1

- Build stage1 rustc-bootstrap.deb using non-Debian rustc
- Build regular rustc.deb using rustc-bootstrap

# Bootstrapping: Debian details

## debian/rules

```
ifneq (,$(findstring stage1,$(DEB_BUILD_PROFILE)))
    DEB_MAKE_BUILD_TARGET = rustc-stage1
    DEB_MAKE_CHECK_TARGET = check-stage1-rpass
    DH_OPTIONS += --package=rustc-bootstrap
endif
```



# Bootstrapping new architecture

- Assume rustc can cross-compile to target
- `dpkg --add-architecture s390x`  
`apt-get source --compile \`  
`--host-architecture s390x \`  
`--build-profiles stage1`
- Basically these set `DEB_BUILD_*` and `DEB_TARGET_*` environment variables before invoking `debian/rules`

# More Information

- <https://wiki.debian.org/DebianBootstrap>
- <https://wiki.linaro.org/Platform/DevPlatform/CrossCompile/CrossBuilding>

# Rust the language

- Looks like C/C++
- Uses LLVM
- Types from Haskell, interfaces/channels from go, etc
- Strong ownership of data
  - Data lifetime built in to compiler
  - Move semantics by default
- All the cleverness is in the compiler
  - Very minimal runtime
  - The result can easily call to/from C, for example
  - Embedded, kernel modules, etc possible

# Rust the language

Punting this part of the talk to [Rust by example](#)

See also <http://rust-lang.org/> and [Rust Programming Language Book](#)