Rust, RPMs and the fine art of dependency building

Fedora eBPF SIG

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How it started

Part of the CNCF since June, 2024

How it started

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Orchestrating eBPF Applications in Kubernetes and Fedora

A Track: Containers devroom
🏠 **Room:** UB2.252A (Lameere)
🗓 **Day:** Saturday
▶ **Start:** 15:40
■ **End:** 16:10
🎞 **Video only:** ub2252a
💬 **Chat:** Join the conversation!

fedora

How it started

Changes/Add bpfman to Fedora

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< Changes

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🔗 Add bpfman to Fedora

🔗 Summary

bpfman: An eBPF Manager bpfman operates as an eBPF manager, focusing on simplifying the deployment and administration of eBPF programs. Its notable features encompass:

- System Overview: Provides insights into how eBPF is utilized in your system.
- eBPF Program Loader: Includes a built-in program loader that supports program cooperation for XDP and TC programs, as well as deployment of eBPF programs from OCI images.
- eBPF Filesystem Management: Manages the eBPF filesystem, facilitating the deployment of eBPF applications without requiring additional privileges.

We do aim to have this included in Fedora 40 and besides the packaging work wanted to create a Self Contained change for wide communication to the community. It provides an easy way to load eBPF program and eventually we'd like for it to become a de-facto standard, but that's outside of the scope of this change.
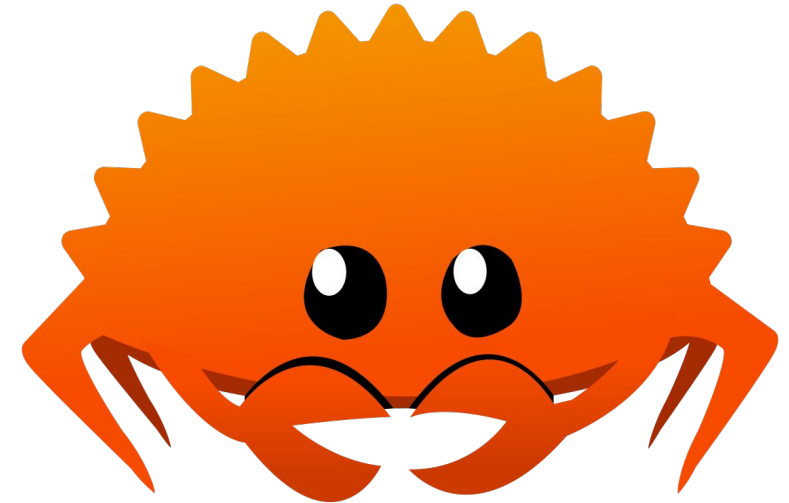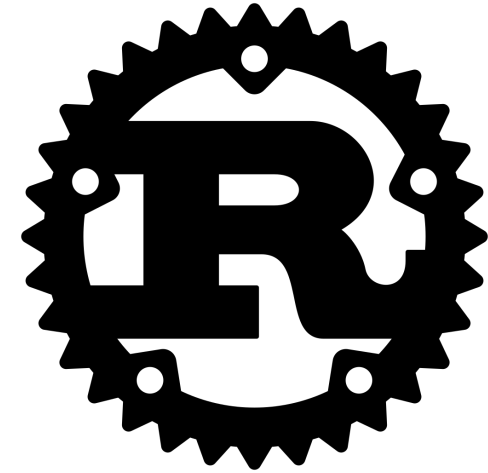
🔗 Owner

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Packaging bpfman

Packaging bpfman

- bpfman's main component is written in rust

- Available in Fedora starting Fedora 42

- Built mainly using rust2rpm

- Was originally intended for Fedora 40
  - Dependencies...

In general, packages SHOULD NOT use bundled crate dependencies, whenever possible.

Rust Packaging Guidelines

Fedora packages SHOULD make every effort to avoid having multiple, separate, upstream projects bundled together in a single package

Fedora Packaging Guidelines

rust2rpm

- **rust2rpm** is a tool developed by the Rust SIG (Special Interest Group).
- Designed to standardize and streamline the creation of RPM spec files for Rust packages.
- Automates much of the packaging process, reducing manual effort.
- Primarily works with packages from crates.io, fetching metadata and dependencies.
- Written in Python.

Cargo.toml

fedora

Packaging bpfman

- $ rust2rpm bpfman

- $ spectool -g rust-bpfman.spec

- $ fedpkg --release f40 mockbuild

```
Problem 1: nothing provides requested (crate(aya) >= 0.13.1 with crate(aya) < 0.14.0~)
 Problem 2: nothing provides requested (crate(aya-obj) >= 0.2.1 with crate(aya-obj) < 0.3.0~)
 Problem 3: nothing provides requested (crate(bpfman-csi/default) >= 1.8.0 with crate(bpfman-csi/default) < 2.0.0~)
 Problem 4: nothing provides requested (crate(oci-distribution) >= 0.11.0 with crate(oci-distribution) < 0.12.0~)
 Problem 5: nothing provides requested (crate(oci-distribution/native-tls) >= 0.11.0 with crate(oci-distribution/native-tls) < 0.12.0~)
 Problem 6: nothing provides requested (crate(oci-distribution/trust-dns) >= 0.11.0 with crate(oci-distribution/trust-dns) < 0.12.0~)
 Problem 7: nothing provides requested (crate(sigstore) >= 0.10.0 with crate(sigstore) < 0.11.0~)
 Problem 8: nothing provides requested (crate(sigstore/cached-client) >= 0.10.0 with crate(sigstore/cached-client) < 0.11.0~)
 Problem 9: nothing provides requested (crate(sigstore/cosign-native-tls) >= 0.10.0 with crate(sigstore/cosign-native-tls) < 0.11.0~)
 Problem 10: nothing provides requested (crate(sigstore/sigstore-trust-root) >= 0.10.0 with crate(sigstore/sigstore-trust-root) < 0.11.0~)
 Problem 11: nothing provides requested (crate(systemd-journal-logger) >= 2.2.0 with crate(systemd-journal-logger) < 3.0.0~)
 Problem 12: nothing provides requested (crate(tonic) >= 0.11.0 with crate(tonic) < 0.12.0~)
 Problem 13: nothing provides requested (crate(tonic/transport) >= 0.11.0 with crate(tonic/transport) < 0.12.0~)
 Problem 14: nothing provides requested (crate(url) >= 2.5.4 with crate(url) < 3.0.0~)
```

Packaging aya?

- $ rust2rpm aya

- $ spectool -g rust-aya.spec

- $ fedpkg --release f40 mockbuild

```
Problem 1: nothing provides requested (crate(aya-obj/default) >= 0.2.1 with crate(aya-obj/default) < 0.3.0~)
 Problem 2: nothing provides requested (crate(aya-obj/std) >= 0.2.1 with crate(aya-obj/std) < 0.3.0~)
```

Packaging aya-obj for aya?

- $ rust2rpm aya-obj

- $ spectool -g rust-aya-obj.spec

- $ fedpkg --release f40 mockbuild

```
Problem: nothing provides requested (crate(rbpf) >= 0.3.0 with crate(rbpf) < 0.4.0~)
```

Packaging rbpf for aya-obj?

- $ rust2rpm rpbf

- $ spectool -g rust-rbpf.spec

- $ fedpkg --release f40 mockbuild

```
Problem: nothing provides requested (crate(json/default) >= 0.11.0 with crate(json/default) < 0.12.0~)
```

Packaging json for rbpf?

- $ rust2rpm json

```
WARNING: Crate 'json' is already packaged for Fedora:
         https://src.fedoraproject.org/rpms/rust-json
• Re-run with --no-existence-check to create a new spec file from scratch.
```

Packaging oci-distribution for aya?

- $ rust2rpm oci-distribution

- $ spectool -g rust-oci-distribution.spec

- $ fedpkg --release f40 mockbuild

```
Problem 1: nothing provides requested (crate(docker_credential/default) >= 1.0.0 with crate(docker_credential/default) < 2.0.0~)
 Problem 2: nothing provides requested (crate(jwt/default) >= 0.16.0 with crate(jwt/default) < 0.17.0~)
 Problem 3: nothing provides requested (crate(olpc-cjson/default) >= 0.1.0 with crate(olpc-cjson/default) < 0.2.0~)
 Problem 4: nothing provides requested (crate(testcontainers/default) >= 0.15.0 with crate(testcontainers/default) < 0.16.0~)
```

Packaging sigstore for aya?

- $ rust2rpm sigstore

- $ spectool -g rust-sigstore.spec

- $ fedpkg --release f40 mockbuild

```
Problem 1: nothing provides requested (crate(docker_credential/default) >= 1.3.0 with crate(docker_credential/default) < 2.0.0~)
Problem 2: nothing provides requested (crate(json-syntax/canonicalize) >= 0.12.0 with crate(json-syntax/canonicalize) < 0.13.0~)
Problem 3: nothing provides requested (crate(json-syntax/default) >= 0.12.0 with crate(json-syntax/default) < 0.13.0~)
Problem 4: nothing provides requested (crate(json-syntax/serde) >= 0.12.0 with crate(json-syntax/serde) < 0.13.0~)
Problem 5: nothing provides requested (crate(oci-distribution) >= 0.11.0 with crate(oci-distribution) < 0.12.0~)
Problem 6: nothing provides requested (crate(oci-distribution/native-tls) >= 0.11.0 with crate(oci-distribution/native-tls) < 0.12.0~)
Problem 7: nothing provides requested (crate(olpc-cjson/default) >= 0.1.0 with crate(olpc-cjson/default) < 0.2.0~)
Problem 8: nothing provides requested (crate(openidconnect) >= 3.5.0 with crate(openidconnect) < 4.0.0~)
Problem 9: nothing provides requested (crate(openidconnect/native-tls) >= 3.5.0 with crate(openidconnect/native-tls) < 4.0.0~)
Problem 10: nothing provides requested (crate(openidconnect/reqwest) >= 3.5.0 with crate(openidconnect/reqwest) < 4.0.0~)
Problem 11: nothing provides requested (crate(rstest/default) >= 0.22.0 with crate(rstest/default) < 0.23.0~)
Problem 12: nothing provides requested (crate(sigstore_protobuf_specs/default) >= 0.3.0 with crate(sigstore_protobuf_specs/default) < 0.4.0~)
Problem 13: nothing provides requested (crate(testcontainers/default) >= 0.22.0 with crate(testcontainers/default) < 0.23.0~)
Problem 14: nothing provides requested (crate(tls_codec/default) >= 0.4.0 with crate(tls_codec/default) < 0.5.0~)
Problem 15: nothing provides requested (crate(tls_codec/derive) >= 0.4.0 with crate(tls_codec/derive) < 0.5.0~)
Problem 16: nothing provides requested (crate(tough/default) >= 0.18.0 with crate(tough/default) < 0.19.0~)
Problem 17: nothing provides requested (crate(tough/http) >= 0.18.0 with crate(tough/http) < 0.19.0~)
Problem 18: nothing provides requested (crate(x509-cert/builder) >= 0.2.0 with crate(x509-cert/builder) < 0.3.0~)
Problem 19: nothing provides requested (crate(x509-cert/default) >= 0.2.0 with crate(x509-cert/default) < 0.3.0~)
Problem 20: nothing provides requested (crate(x509-cert/pem) >= 0.2.0 with crate(x509-cert/pem) < 0.3.0~)
Problem 21: nothing provides requested (crate(x509-cert/sct) >= 0.2.0 with crate(x509-cert/sct) < 0.3.0~)
Problem 22: nothing provides requested (crate(x509-cert/std) >= 0.2.0 with crate(x509-cert/std) < 0.3.0~)
```

edora

Packaging bpfman

- Can you see a trend?

Packaging bpfman

- Missing in Fedora

    - oci-distribution

    - sigstore

    - sled

    - systemd-journal-logger

    - Tonic

- Too new in Fedora

    - netlink-packet-route

    - rtnetlink

- Too old in Fedora

    - comfy-table

    - prost / prost-types

Packaging bpfman

- More than 200 new dependencies are required for bpfman

- What if package is vendored?

Packaging bpfman by bundling dependencies

rust2rpm and cargo issues

- rust2rpm -V auto can generate vendored, but
- rust2rpm can't handle patching of vendored dependencies.
- How can I patch a vendored dependency?
  - Ugly script / hand
- Cargo checksum wrongly identified
- Weak cryptographic dependencies such as p434 elliptic curve may get in such as in fiat-crypto, not allowed by Fedora legal.

```
12      pub mod p256_scalar_32;
13      pub mod p256_scalar_64;
14      pub mod p384_32;
15      pub mod p384_64;
16      pub mod p384_scalar_32;
17      pub mod p384_scalar_64;
18      pub mod p434_64;
19      pub mod p448_solinas_32;
20      pub mod p448_solinas_64;
21      pub mod p521_32;
22      pub mod p521_64;
```

Introducing rust2rpm-vendor Tool

- Tool written by the rust-sig group in order to make the spec creating standarized and seamless.
- Written in python
- -p, --patch   Do manual patching of Cargo.toml
- Opens Cargo.toml in the default editor to apply changes and generate a patch file before loading project metadata

```toml
[package]
edition = "2018"
name = "olpc-cjson"
version = "0.1.4"
authors = ["iliana destroyer of worlds <iweller@amazon.com>"]
build = false
autobins = false
autoexamples = false
autotests = false
autobenches = false
description = "serde_json Formatter to serialize as OLPC-style canonical JSON"
readme = "README.md"
keywords = ["json"]
license = "MIT OR Apache-2.0"
repository = "https://github.com/awslabs/tough"
resolver = "2"

[lib]
name = "olpc_cjson"
path = "src/lib.rs"

[[bin]]
name = "olpc-cjson"
path = "src/main.rs"

[dependencies.serde]
version = "1"

[dependencies.serde_json]
version = "1"
```

Some offending spec files

- https://src.fedoraproject.org/rpms/bpfman/raw/rawhide/f/bpfman.spec
- https://src.fedoraproject.org/rpms/fractal/raw/rawhide/f/fractal.spec

Final result

Daniel Mellado   2024-03-13 18:35:02 UTC   Description

Spec URL: https://dmellado.fedorapeople.org/bpfman/bpfman.spec
SRPM URL: https://dmellado.fedorapeople.org/bpfman/
bpfman-0.4.0-0.1.20240313gita11dd61.fc39.src.rpm

Description:
bpfman operates as an eBPF manager, focusing on simplifying the deployment and
administration of eBPF programs.

Fedora Account System Username: dmellado

Fedora Review Service   2024-03-13 23:57:45 UTC   Comment 1
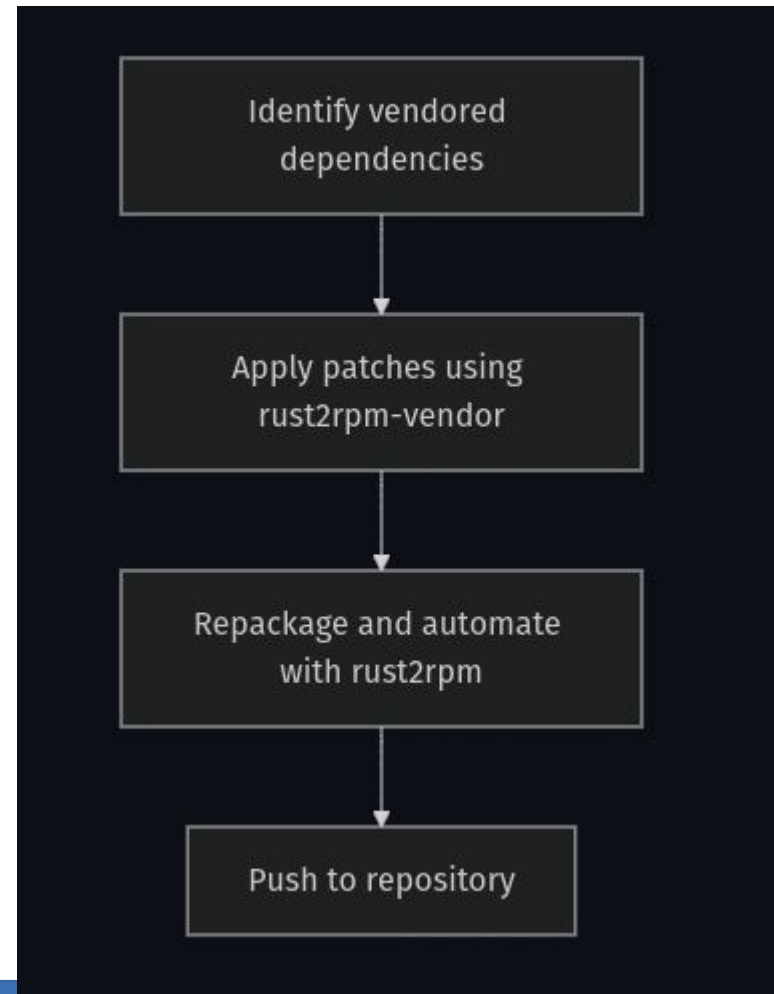
MANY MONTHS LATER

Fedora Admin user for bugzilla script actions   2024-12-12 08:37:46 UTC   Comment 73

The Pagure repository was created at https://src.fedoraproject.org/rpms/bpfman

9 months of work from first proposal until a proper package and bundling process is defined.

Future work at the rust-sig

Future work at the rust-sig

```
1  # Fedora Rust Hackfest 2025-01-29
2
3  ## Vendoring
4
5  - tooling support for "patching" vendored contents:
6    https://pagure.io/fedora-rust/rust2rpm/issue/286
7      - Tool living inside rust2rpm-helper
8      - https://pagure.io/fedora-rust/rust2rpm-helper/blob/main/f/src
9      -> @dmellado
10
11 ## Licenses
12
13 - tool for simplifying License expressions:
14   https://pagure.io/fedora-rust/rust2rpm/issue/306
15   -> @decathorpe
16
17 ## Documentation
18
19 - https://pagure.io/fedora-rust/rust2rpm-cookbook
20 - hosting rendered manpages (creating tox)
21   -> @decathorpe
22
23 ## Tooling
24
25 - rpmlint rules for empty +feature subpkgs (`rust-$crate+feature-devel`,
   `python3-foo+extra`) - ignore "W: no-documentation"
26 - ship rpmlintrc configs with built packages?
27   -> FPC
28 - warn for executable `*.rs` files in rust2rpm:
29   https://pagure.io/fedora-rust/rust2rpm/issue/307
30   -> @decathorpe
31 - add `excluded-arch` https://pagure.io/fedora-rust/rust2rpm/issue/308
32   -> Michel
33
```

Fedora ebpf-sig group

Fedora eBPF SIG Group

- A new sig group was created in late 2023 to gather interest around eBPF in Fedora. Fedora eBPF Special Interest Group

- Identified bpfman as a useful tool to use as a bpf manager and decided to push for it to be included in Fedora.

- Maintainers of bpfman rpm alongside rust-sig (Thanks Fabio!)
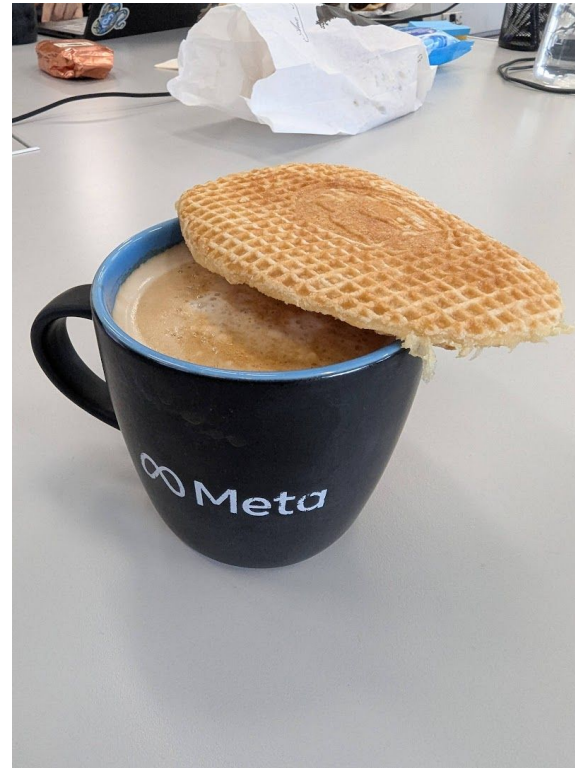
Key takeaways

Key takeaways

- Bundling rust projects can be an option

- Standardizing tooling allows not having to reinvent wheel for each package

- If trying to package an application written in Rust for Fedora:

  ○ Ask rust-sig

  ○ Make sure you've asked rust-sig

  ○ Work with rust-sig

Questions?

Huge kudos to:

- Fedora's rust-sig guru:

  - Fabio Valentini

- Meta's team for their work in Fedora and hosting the Fedora Rust hackfest:

  - Davide Cavalca

  - Michel Lind

Thank you for attending!