PRACTICAL SOFTWARE FREEDOM WITH GNU GUIX

Jack Hill
Duke University Libraries

Ohio Linux Fest 2019
Guix

- *gi:ks*
- Like “geeks”

GNU Project

- Guile
- Shepherd
- mcron
- Mes
- glibc, gcc, ...
**FOUR FREEDOMS**

- Run software as I wish
- Study software
- Distribute software
- Distribute modified software
Bradley Kuhn on Debian [1]

For the user, that means when I hear about some interesting software, Debian immediately connects me, via apt, with the individual expert who knows about that software and my operating system / distribution both.
(non-)Practical Solutions

- Elaborate Build Infrastructure
- Elaborate Deployment Infrastructure
- Just Works™ Dependency Managers

Warning!
State
The Store

A Sampling of Items from /gnu/store

1. ...-emacs-26.3/
2. ...-pwgen-2.08/
3. ...-module-import-compiled.drv
4. ...-mcron-job
5. ...-totem-meson-easy-codec.patch
6. ...-shepherd-file-system--gnu-store.go
Inside a Store Item

```bash
$ tree --filelimit 5 ...-emacs-26.3
  bin [6 entries exceeds filelimit, not opening dir]
  include
    emacs-module.h
  lib
    systemd
      user
        emacs.service
  libexec
    emacs
      26.3
        x86_64-pc-linux-gnu
            hexl
            profile
            rcs2log
```
Profiles

Create a View Into Store

1 $ guix package -p /tmp/example -i hello emacs cowsay
2 The following packages will be installed:
3   hello       2.10   /gnu/store/...
4   emacs       26.3   /gnu/store/...
5   cowsay     3.04   /gnu/store/...
### Inside the New Profile

```
$ cd /tmp/example && ls -l
... bin/
... etc/
... include -> /gnu/store/...-emacs-26.3/include
... lib/
... libexec -> /gnu/store/...-emacs-26.3/libexec
... manifest
... share/
```
## Profiles

### One More Level In

```bash
$ cd bin && ls -l
... cowsay -> ...cowsay-3.04/bin/cowsay
... cowthink -> ...cowsay-3.04/bin/cowthink
... ctags -> ...emacs-26.3/bin/ctags
... ebrowse -> ...emacs-26.3/bin/ebrowse
... emacs -> ...emacs-26.3/bin/emacs
... emacs-26.3 -> ...emacs-26.3/bin/emacs-26.3
... emacsclient -> ...emacs-26.3/bin/emacsclient
... etags -> ...emacs-26.3/bin/etags
... hello -> ...hello-2.10/bin/hello
```
A Sampling of Items from /gnu/store

1. ...-emacs-26.3/
2. ...-pwgen-2.08/
3. ...-module-import-compiled.drv
4. ...-mcron-job
5. ...-totem-meson-easy-codec.patch
6. ...-shepherd-file-system--gnu-store.go
A Sampling of Items from /gnu/store

1. djza93lqjcnamfd4794bp8mvipd6fz4-emacs-26.3/
2. yp1m1w4x7xdr5gxs1j101vxg3n7f64w-pwgen-2.08/
3. ib56vrgc2lwhvbn8n15082q4gs83x-module-import-compiled.drv
4. 57h3np9asz239qhk7gv43dm1cidsliwl-mcron-job
5. p6aa1n74akaf9049bmxj7p2a43mbxj14-totem-meson-easy-codec.patch
6. hi72w0a3lp2zfpi6vypq8abfqw60cc3s-shepherd-file-system--gnu-
More than Packages

**Bootloader Configuration Files**

1. $ ls /gnu/store/*grub.cfg
2. /gnu/store/18ca4ik0nfdxbs8n4il59hlm6smq0bi1-grub.cfg
3. /gnu/store/3fswa6vrljiprifdcxdphycfixb82ppa-grub.cfg
4. /gnu/store/3hz4ihmzm83mfyk3wck9vci8xkgbc5hw-grub.cfg
DEFINING A PACKAGE

DUO-SCP I

(define-public duo-scp
  (package
   (name "duo-scp")
   (version "0")
   (source
    (origin
     (method url-fetch)
     (uri "https://gitlab.oit.duke.edu/snippets/82/raw")
     (sha256
      (base32 "1mrf5451cj8010iq76866dli1hxa31rk8i993arf9dfy2b")
     (file-name name))))
DUO-SCP II

(build-system trivial-build-system)
  (arguments
   `( #:modules ((guix build utils))
     #:builder
     (begin
      (use-modules (guix build utils))
      (let ((source (assoc-ref %build-inputs "source"))
     (ssh (assoc-ref %build-inputs "openssh"))
     (bash (assoc-ref %build-inputs "bash"))
     (script "duo-scp")
     (out (assoc-ref %outputs "out"))))
    )
  )
DUO-SCP III

1 (copy-file source script)
2 (substitute* script
3 (("/bin/bash") (string-append bash " /bin/bash"))
4 (("scp") (string-append ssh " /bin/scp")))
5 (chmod script #0555)
6 (install-file script (string-append out " /bin")))))))
7 (inputs
8 `(("bash" ,bash)
9 ("openssl" ,openssl)))
DUO-SCP IV

1 (home-page "https://gitlab.oit.duke.edu/snippets/82/raw")
2 (synopsis "User Duo Passcode with scp and login_duo")
3 (description "Wrapper script for scp...")
4 (license license:cc0))
FOUR FREEDOMS

- Run software as I wish
- Study software
- Distribute software
- Distribute modified software
Focus on Freedom

Potential Pitfalls

- Browsers
- Bootstrapping
SAFE PLACE TO PLAY
Easy Access to Dev Tools

How to Hack on Guix

1. $ git clone https://.../guix.git && cd guix
2. $ guix environment guix
3. $ # make changes
4. $ ./bootstrap && configure --localstatedir=/var && \\make
5. $ # try out changes right away
6. $ ./pre-inst-env guix ...

1 2 3 4 5 6 7
Moving Bits Around

**One-off Copy**

$ guix copy --from=remote-host

**Exporting for Use Outside of Guix**

$ guix pack -f docker dovecot

**Serve Packages**

$ guix publish
Offloading

MACHINES.SCM

(list
  (build-machine
    (name "builder")
    (system "x86_64-linux")
    (user "example")
    (host-key "ssh-ed25519 ...")
    (private-key "/root/.ssh/id_ed25519")))
BUILDING BLOCKS

- Guix Workflow Language
- Guix Jupyter Kernel
- Guix Deploy
Thank You

Software Freedom
  Practical Problems
Tour of GNU Guix
  The Store
  Reproducible Builds
  Package Programming
Guix Enables Freedom
  Philosophy
  Unique Properties
  Neat Tricks

https://jackhill.us/talks/guix-software-freedom/