

PRACTICAL SOFTWARE FREEDOM WITH GNU GUIX



Jack Hill
Duke University Libraries

Ohio Linux Fest 2019



GUIX? GUIX!

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

SOFTWARE IS COMPLICATED

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

```
1 $ tree --filelimit 5 ...-emacs-26.3
2   bin [6 entries exceeds filelimit, not opening dir]
3   include
4       emacs-module.h
5   lib
6       systemd
7           user
8               emacs.service
9   libexec
10       emacs
11           26.3
12               x86_64-pc-linux-gnu
13                   hexl
14                       profile
15                           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/...
```


PROFILES

INSIDE THE NEW PROFILE

```
1 $ cd /tmp/example && ls -l
2 ... bin/
3 ... etc/
4 ... include -> /gnu/store/...-emacs-26.3/include
5 ... lib/
6 ... libexec -> /gnu/store/...-emacs-26.3/libexec
7 ... manifest
8 ... share/
```

PROFILES

ONE MORE LEVEL IN

```
1 $ cd bin && ls -l
2 ... cowsay -> ...cowsay-3.04/bin/cowsay
3 ... cowthink -> ...cowsay-3.04/bin/cowthink
4 ... ctags -> ...emacs-26.3/bin/ctags
5 ... ebrowse -> ...emacs-26.3/bin/ebrowse
6 ... emacs -> ...emacs-26.3/bin/emacs
7 ... emacs-26.3 -> ...emacs-26.3/bin/emacs-26.3
8 ... emacsclient -> ...emacs-26.3/bin/emacsclient
9 ... etags -> ...emacs-26.3/bin/etags
10 ... hello -> ...hello-2.10/bin/hello
```

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
```

ON HASHES

A SAMPLING OF ITEMS FROM /GNU/STORE

```
1  djza93lqjcndsldf4794bp8mvipd6fz4-emacs-26.3/  
2  yp1m1w4x7xdr5gxsd1jl01vxg3n7f64w-pwgen-2.08/  
3  ib56vrgc2lcwhvbdns8nl5082q4gs83x-module-import-compiled.dr  
4  57h3np9asz239qhk7gv43dm1cidsliwl-mcron-job  
5  p6aa1n74akaf9049bmxj7p2a43mbxj14-totem-meson-easy-codec.pat  
6  hi72w0a3lp2zfpfi6vypq8abfqw60cc3s-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

```
1 (define-public duo-scp
2   (package
3     (name "duo-scp")
4     (version "0")
5     (source
6       (origin
7         (method url-fetch)
8         (uri "https://gitlab.oit.duke.edu/snippets/82/raw")
9         (sha256
10            (base32 "1mrf5451cj8010iq76866dli1hxa31rk8i993arf9dfy
11            (file-name name)))
```

DUO-SCP II

```
1 (build-system trivial-build-system)
2   (arguments
3     `(:modules ((guix build utils))
4       #:builder
5       (begin
6         (use-modules (guix build utils))
7         (let ((source (assoc-ref %build-inputs "source"))
8               (ssh (assoc-ref %build-inputs "openssh"))
9               (bash (assoc-ref %build-inputs "bash"))
10              (script "duo-scp")
11              (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 #o555)
6 (install-file script (string-append out "/bin")))))
7 (inputs
8   `(("bash" ,bash)
9     ("openssh" ,openssh)))
```


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)))
```

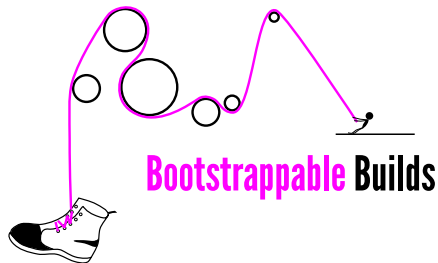
FOUR FREEDOMS

- 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 && \
5   make
6 $ # try out changes right away
7 $ ./pre-inst-env guix ...
```

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

```
1 (list
2   (build-machine
3     (name "builder")
4     (system "x86_64-linux")
5     (user "example")
6     (host-key "ssh-ed25519 ...")
7     (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/](https://jackhill.us/talks/guix-software-freedom/)

REFERENCES I



Bradley Kuhn. *What Debian Does For Me*. licensed: Creative Commons Attribution-Share Alike 3.0 United States License. 2018-12-15. URL: <http://ebb.org/bkuhn/blog/2018/12/15/what-debian-does.html> (visited on 10/28/2019).