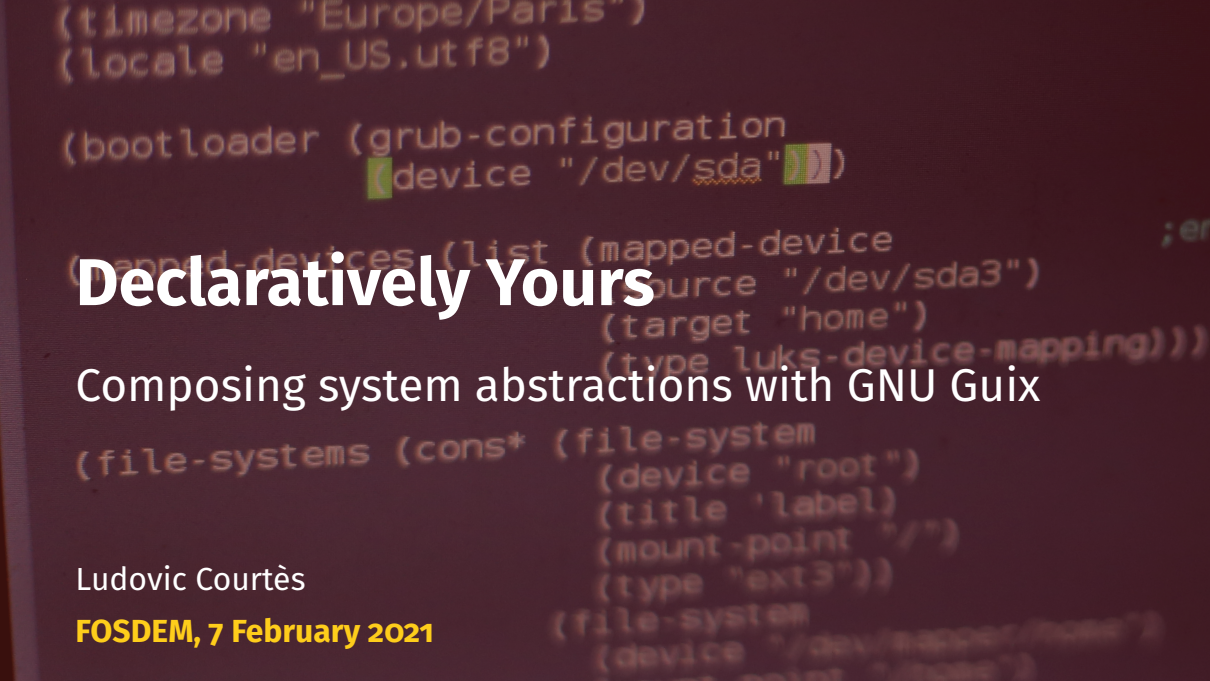


Declaratively Yours

Composing system abstractions with GNU Guix

Ludovic Courtès

FOSDEM, 7 February 2021

Desired state and 'idempotency'

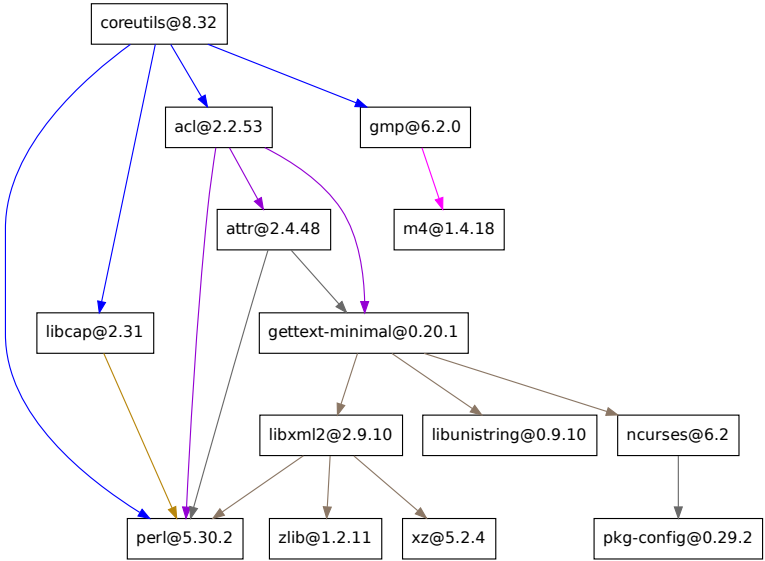
Most Ansible modules check whether the desired final state has already been achieved, and exit without performing any actions if that state has been achieved, so that repeating the task does not change the final state. Modules that behave this way are often called 'idempotent.' Whether you run a playbook once, or multiple times, the outcome should be the same. However, not all playbooks and not all modules behave this way. If you are unsure, test your playbooks in a sandbox environment before running them multiple times in production.


{ fetchurl, stdenv } :
function definition
stdenv . mkDerivation {
name = "hello-2.3";
src = fetchurl {
url = mirror://gnu/hello/hello-2.3.tar.bz2;
sha256 = "0c7vijq8y68...";
};
meta = {
description = "Produce a friendly greeting";
homepage = http://www.gnu.org/software/hello/;
license = "GPLv3+";
};
}
function call

Bill of rights:

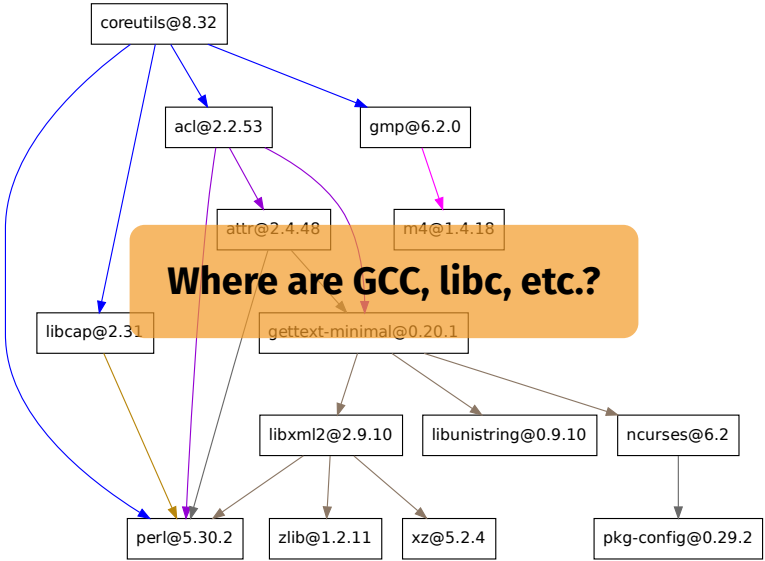
1. What You Declare is What You Get
2. Declarations Bring Structure

The package structure.



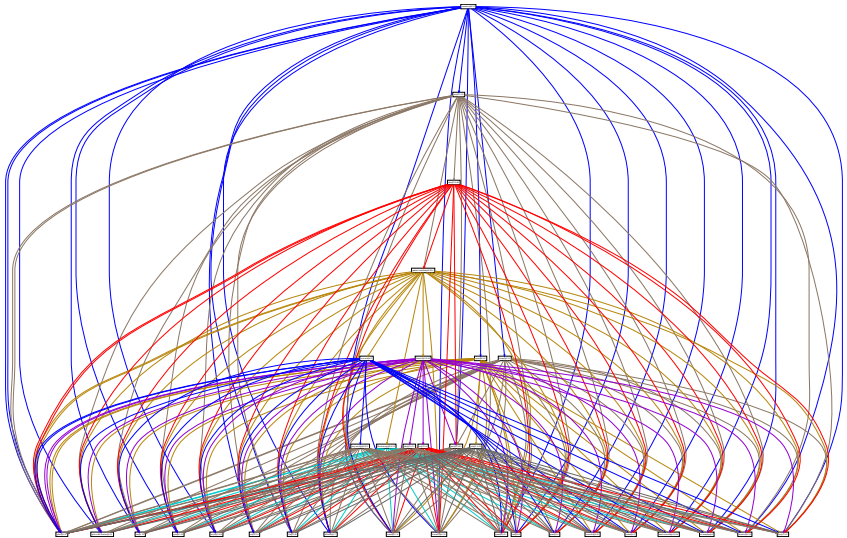
14 nodes

`guix graph --type=`**`package`** `coreutils`



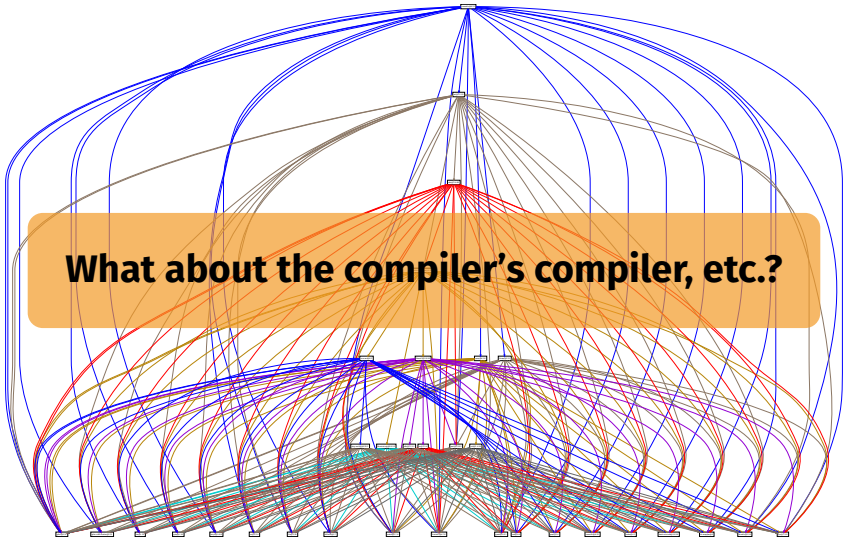
14 nodes

`guix graph --type=package coreutils`



33 nodes

`guix graph --type=bag-emerged coreutils`



33 nodes

`guix graph --type=bag-emerged coreutils`

(too big)

120 nodes

`guix graph --type=bag coreutils`

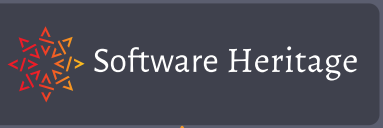
(too big)

455 nodes

`guix graph --type=derivation coreutils`

```
(define audacity
  (package
    (name "audacity")
    (home-page "https://github.com/audacity/audacity")
    (source (origin
              (method git-fetch)
              (uri (git-reference
                     (url home-page)
                     (commit "2f30ff07a")
                     (recursive? #t)))
              (sha256
               (base32
                "106rf402cvfdhc2yf...")))))
    ...))
```

```
(define audacity
  (package
    (name "audacity")
    (home-page "https://github.com/audacity/audacity")
    (source (origin
              (method git-fetch)
              (uri (git-reference
                     (url home-page)
                     (commit "2f30ff07a")
                     (recursive? #t)))
              (sha256
               (base32
                "106rf402cvfdhc2yf…"))))
    …))
```




```
guix lint -c archival audacity
```

```
$ guix install gcc-toolchain openmpi hwloc
…
hint: Consider setting the necessary environment
variables by running:

     GUIX_PROFILE="$HOME/.guix-profile"
     . "$GUIX_PROFILE/etc/profile"

Alternatively, see ‘guix package --search-paths’.
```

```
(define gcc
  (package
    ;; …
    (native-search-paths
     (list (search-path-specification
            (variable "C_INCLUDE_PATH")
            (files '("include")))
           (search-path-specification
            (variable "CPLUS_INCLUDE_PATH")
            (files '("include/c++" "include")))
           (search-path-specification
            (variable "LIBRARY_PATH")
            (files '("lib" "lib64")))))))
```

```
guix pack hwloc \
  --with-source=./hwloc-2.1rc1.tar.gz

guix install emacs-next \
  --with-branch=emacs-next=master

guix build guix \
  --with-latest=guile-json
```

- `--with-patch`
- `--with-input`
- `--with-c-toolchain`
- `--with-debug-info`
- `--with-graft`
- …

```
(define (make-glibc-utf8-locales locales)
  (package
    (name "glibc-utf8-locales")
    ...))

(define glibc-utf8-locales
  (make-glibc-utf8-locales (list "ca_ES.utf8" ...)))
```

```
(define emacs
  (package
    (name "emacs")
    ...))

(define emacs-no-x
  (package/inherit emacs
    (name "emacs-no-x")
    ...))

(define emacs-xwidgets
  (package/inherit emacs
    (name "emacs-xwidgets")
    ...))
```

```
(define emacs
  (package
    (name "emacs")
    ...))

(define emacs-no-x
  (package/inherit emacs
    (name "emacs-no-x")
    ...))

(define emacs-xwidgets
  (package/inherit emacs
    (name "emacs-xwidgets")
    ...))
```

What if we could declare **package parameters**?

```
(define emacs
  (package
    (name "emacs")
    ...))

(define emacs-no-x
  (package/inherit emacs
    (name "emacs-no-x")
    ...))

(define emacs-xwidgets
  (package/inherit emacs
    (name "emacs-xwidgets")
    ...))
```

What if we could declare **package paramet**

Package collections.

```
guix package --manifest=my-packages.scm
```

```
(specifications->manifest
  '("emacs" "emacs-geiser"
    "guile" "guile-picture-language"))
```

```
guix install emacs

guix install guile guile-picture-language

guix install emacs-geiser
```

```
guix install emacs

guix install guile guile-picture-language
        guix package --export-manifest
guix install emacs-geiser
```

Systems.

```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
               (bootloader grub-efi-bootloader)
               (target "/boot/efi")))
  (file-systems (append (list (file-system
                               (device (file-system-label "my-root"))
                               (mount-point "/")
                               (type "ext4")))
                        %base-file-systems))
  (users (append (list (user-account
                        (name "charlie")
                        (group "users")
                        (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```

```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
                (bootloader grub-efi-bootloader)
                (target "/boot/efi")))
  (file-systems (append (list (file-system
                                (device (file-system-label "my-root"))
                                (mount-point "/")
                                (type "ext4")))
                        %base-file-systems))
  (users (append (list (user-account
                         (name "charlie")
                         (group "users")
                         (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```

guix system vm config.scm

```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
               (bootloader grub-efi-bootloader)
               (target "/boot/efi")))
  (file-systems (append (list (file-system
                               (device (file-system-label "my-root"))
                               (mount-point "/")
                               (type "ext4")))
                        %base-file-systems))
  (users (append (list (user-account
                        (name "charlie")
                        (group "users")
                        (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```

guix system **docker-image** config.scm

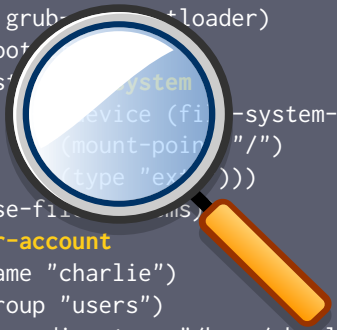
```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
                (bootloader grub-efi-bootloader)
                (target "/boot/efi")))
  (file-systems (append (list (file-system
                                (device (file-system-label "my-root"))
                                (mount-point "/")
                                (type "ext4")))
                        %base-file-systems))
  (users (append (list (user-account
                         (name "charlie")
                         (group "users")
                         (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```

guix system **container** config.scm

```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
                (bootloader grub-efi-bootloader)
                (target "/boot/efi")))
  (file-systems (append (list (file-system
                                (device (file-system-label "my-root"))
                                (mount-point "/")
                                (type "ext4")))
                        %base-file-systems))
  (users (append (list (user-account
                         (name "charlie")
                         (group "users")
                         (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```

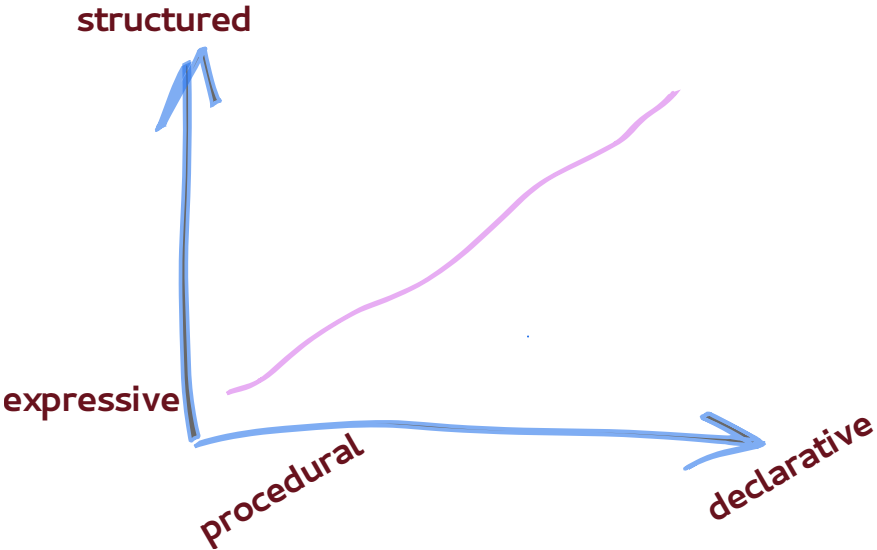
guix system **reconfigure** config.scm

```
(operating-system
  (host-name "guixbox")
  (timezone "Europe/Brussels")
  (locale "fr_BE.utf8")
  (bootloader (bootloader-configuration
                (bootloader grub-
                (target "/boot
  (file-systems (append (lis
                                                  -system-label "my-root"))
                                                  "/")
                                                  )))
                        %base-fi
  (users (append (list (user-account
                         (name "charlie")
                         (group "users")
                         (home-directory "/home/charlie")))
                 %base-user-accounts))
  (services (append (list (service dhcp-client-service-type)
                          (service openssh-service-type))
                    %base-services)))
```



https://notabug.org/civodul/guix-explorer

Wrap-up.


structured
expressive
procedural
declarative

Guix

https://guix.gnu.org/

ludo@gnu.org