Packaging and deploying with GNU Guix and GuixSD

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Upgrades are difficult

https://www.debian.org/releases/squeeze/amd64/release-notes/ch-upgrading.en.html

Upgrades are dangerous

Distribution Upgrade of all the files:

WARNING

Following the upgrade instructions found in the release notes is the best way to ensure that your system upgrades from one major Debian release to another (e.g. from lenny to squeeze) without breakage!

These instructions will tell you to do a `dist-upgrade` (instead of `upgrade`) in the case of apt-get or `full-upgrade` (instead of `safe-upgrade` in the case of aptitude) at least once. So you would have to type something like

```
# aptitude full-upgrade
```

https://wiki.debian.org/DebianPackageManagement

Stateful system management is unpredictable

state 0

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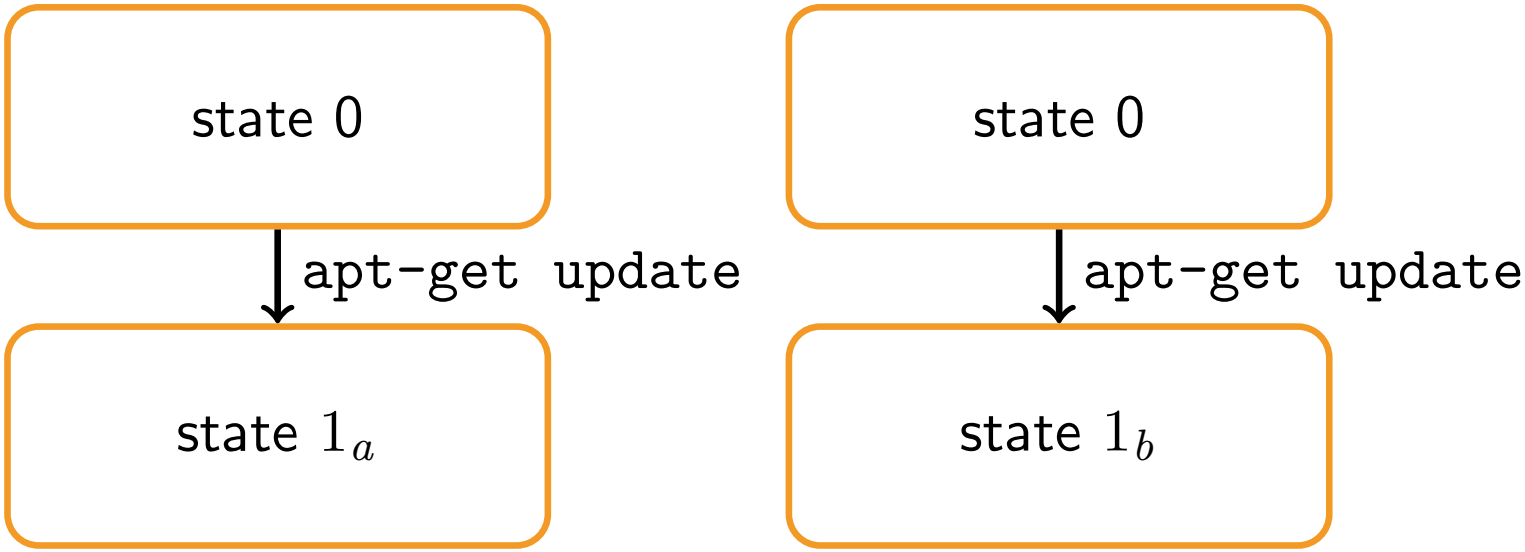
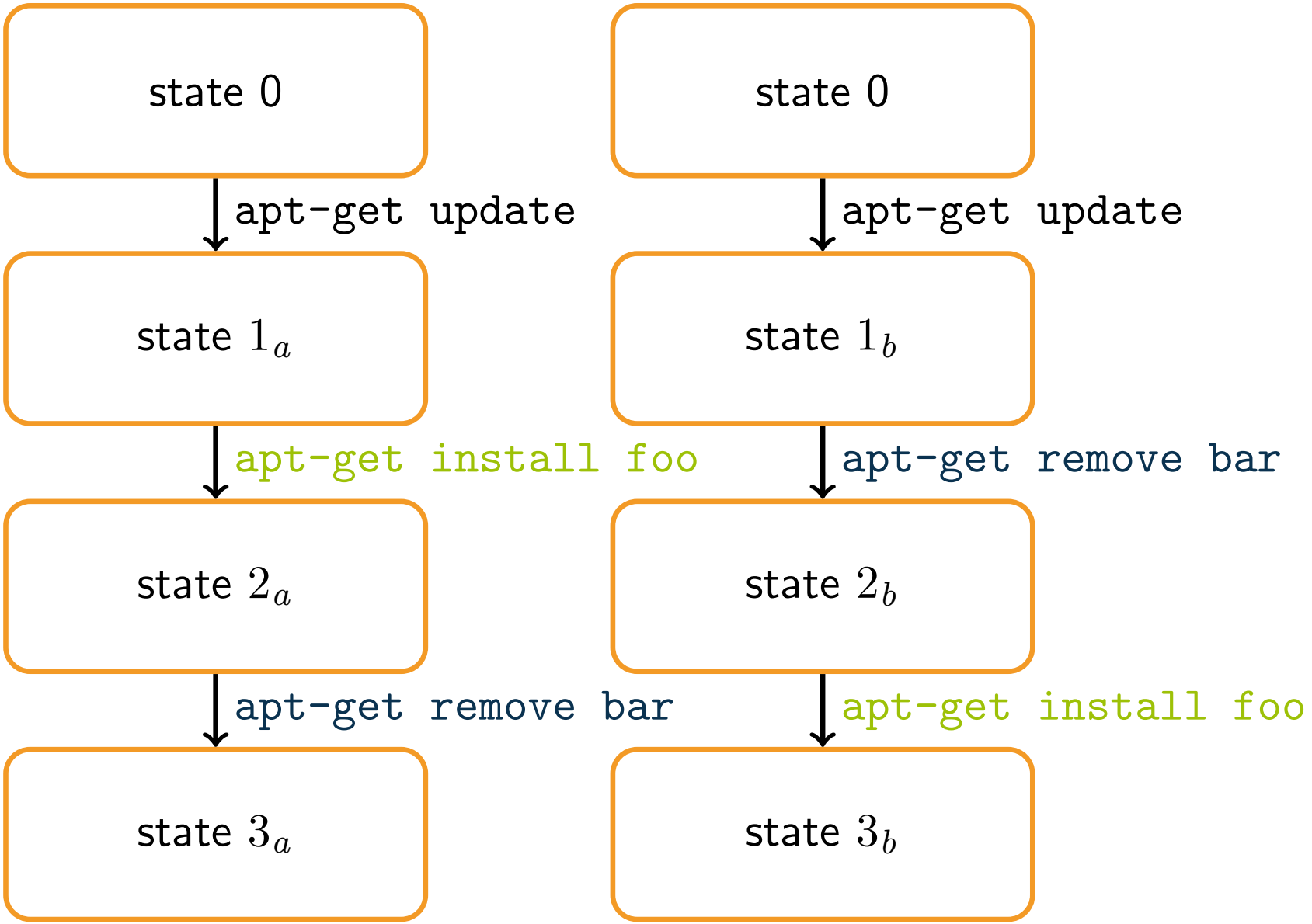
Stateful system management is unpredictable



Stateful system management is unpredictable



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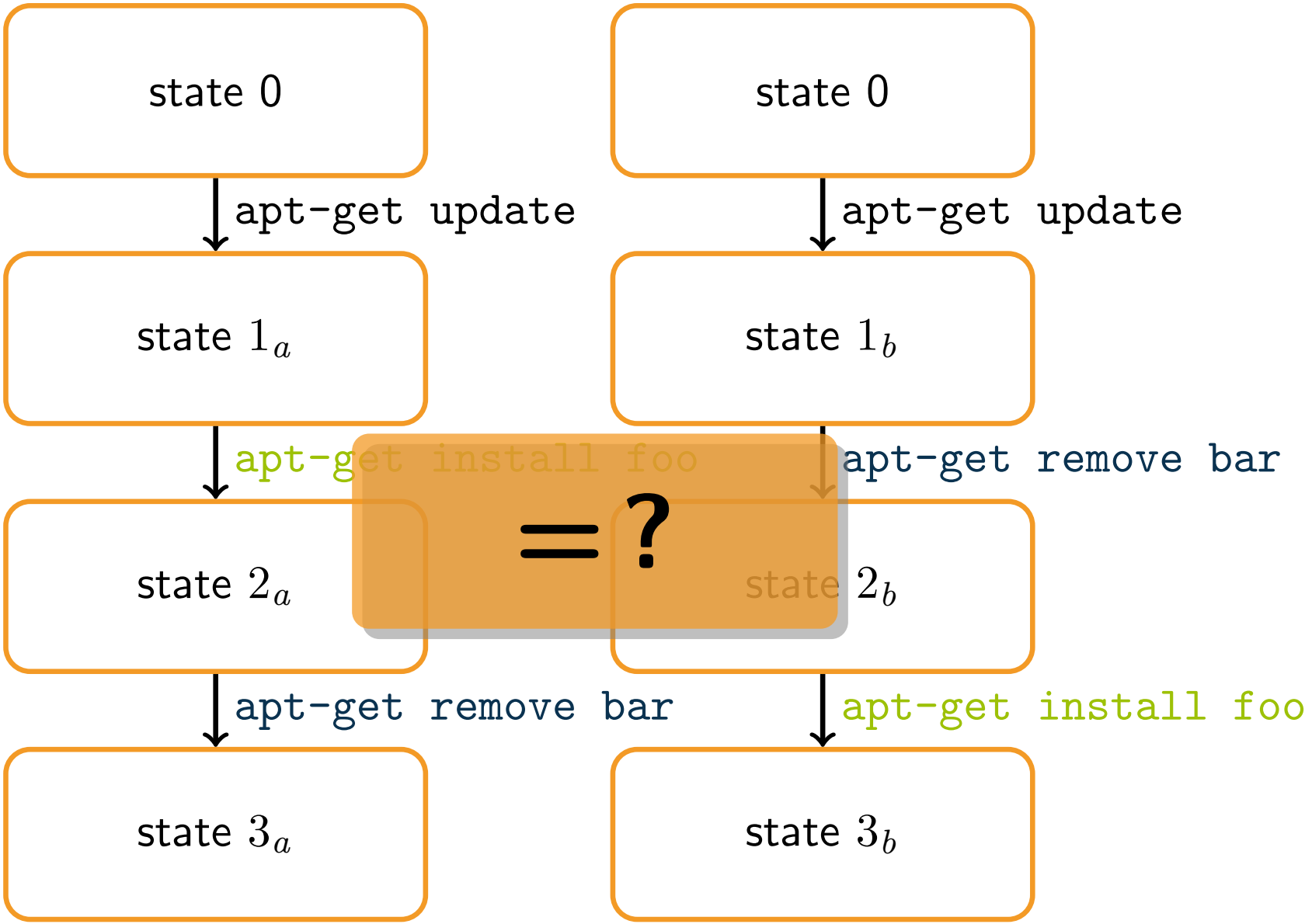

Too many cooks spoil the broth

Application-level package managers [edit]

- Anaconda - a package manager for Python
- Assembly - a partially compiled code library for use in Common Language Infrastructure (CLI) deployment, versioning and security.
- Bower - a package manager for the web.
- Cabal - a programming library and package manager for Haskell
- CocoaPods - Dependency Manager for Objective-C and RubyMotion projects
- Composer - Dependency Manager for PHP
- CPAN - a programming library and package manager for Perl
- CRAN - a programming library and package manager for R
- CTAN - a package manager for TeX
- EasyInstall - a package manager for Python and the PyPI programming library which is part of the Setuptools packaging system
- Gradle - a build system and package manager for Groovy and other JVM languages
- Ivy - a package manager for Java, integrated into the Ant build tool, also used by sbt
- LuaRocks - a programming library and package manager for Lua
- Maven - a package manager and build tool for Java
- npm - a programming library and package manager for Node.js
- NuGet - a package manager for the .NET Framework and C++.
- PAR::Repository and Perl package manager - binary package managers for Perl
- PEAR - a programming library for PHP
- pip - a package manager for Python and the PyPI programming library.
- Quicklisp - a package manager and repository for Common Lisp
- RubyGems - a package manager and repository for Ruby
- sbt - a build tool for Scala, uses Ivy for dependency management
- leiningen - a project automation tool for Clojure

`https://en.wikipedia.org/wiki/List_of_software_package_management_systems`

Fashionable solution: Give up

Over 30% of Official Images in Docker Hub Contain High Priority Security Vulnerabilities

Docker Hub is a central repository for Docker developers to pull and push container images. We performed a detailed study on Docker Hub images to understand how vulnerable they are to security threats. Surprisingly, we found that more than 30% of images in official repositories are highly susceptible to a variety of security attacks (e.g., Shellshock, Heartbleed, Poodle, etc.). For general images – images pushed by docker users, but not explicitly verified by any authority – this number jumps up to ~40% with a sampling error bound of 3%.


HOPE

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Functional package management

$$\text{pari-gp} \quad = \quad f_1(\text{pari-2.7.5.tar.gz}, \text{readline}, \text{gcc-5}, \text{make})$$

Functional package management

$$
\begin{aligned}
\text{pari-gp} &= f_1(\text{pari-2.7.5.tar.gz}, \text{readline}, \text{gcc-5}, \text{make}) \\
\text{readline} &= f_2(\text{readline-6.3.tar.gz}, \text{ncurses}, \text{gcc-5}, \text{make}) \\
\text{ncurses} &= f_3(\text{ncurses-6.0.tar.gz}, \text{gcc-5}, \text{make})
\end{aligned}
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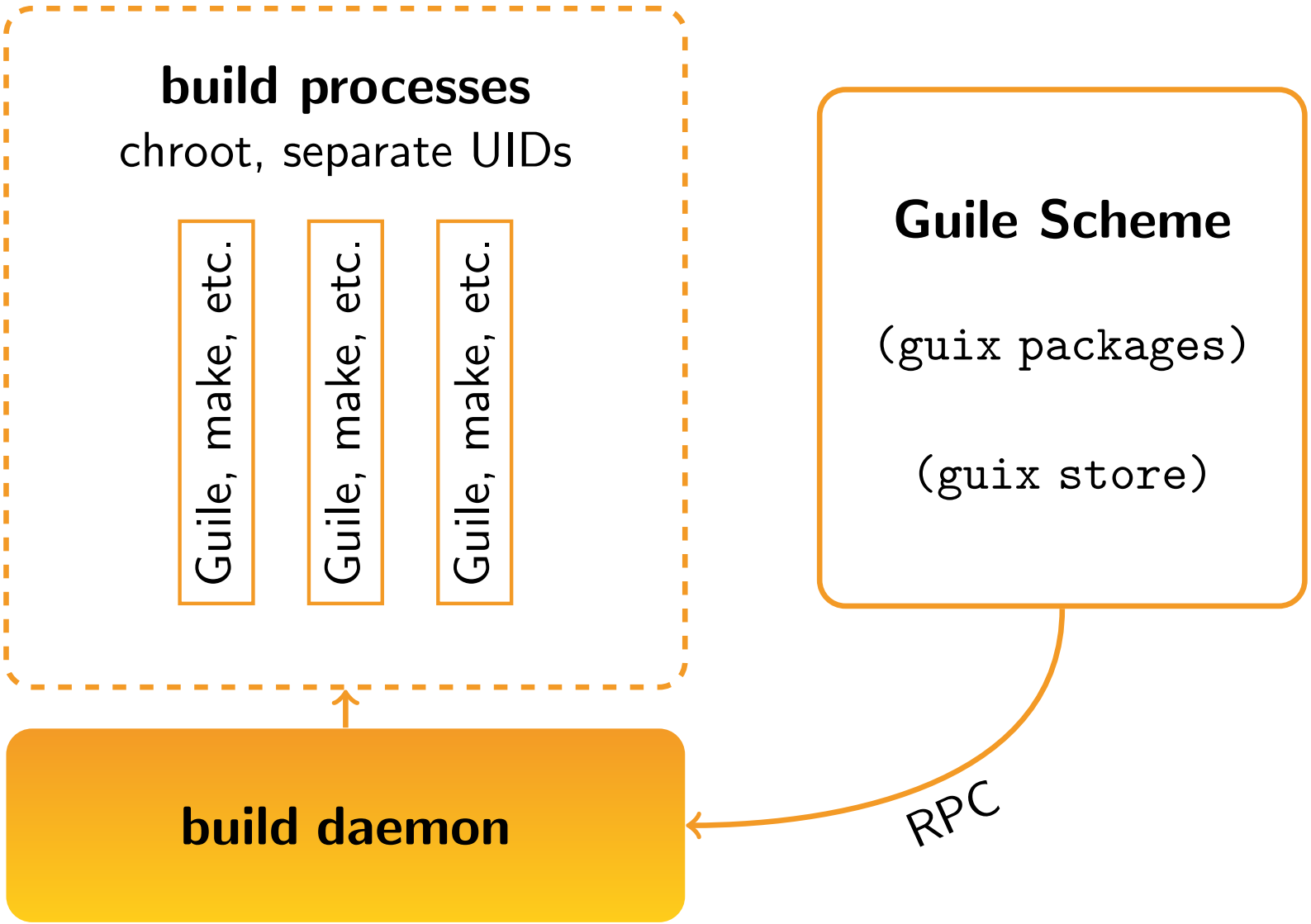
Full directed acyclic graph of dependencies is captured,
with a few bootstrap binaries at the root.

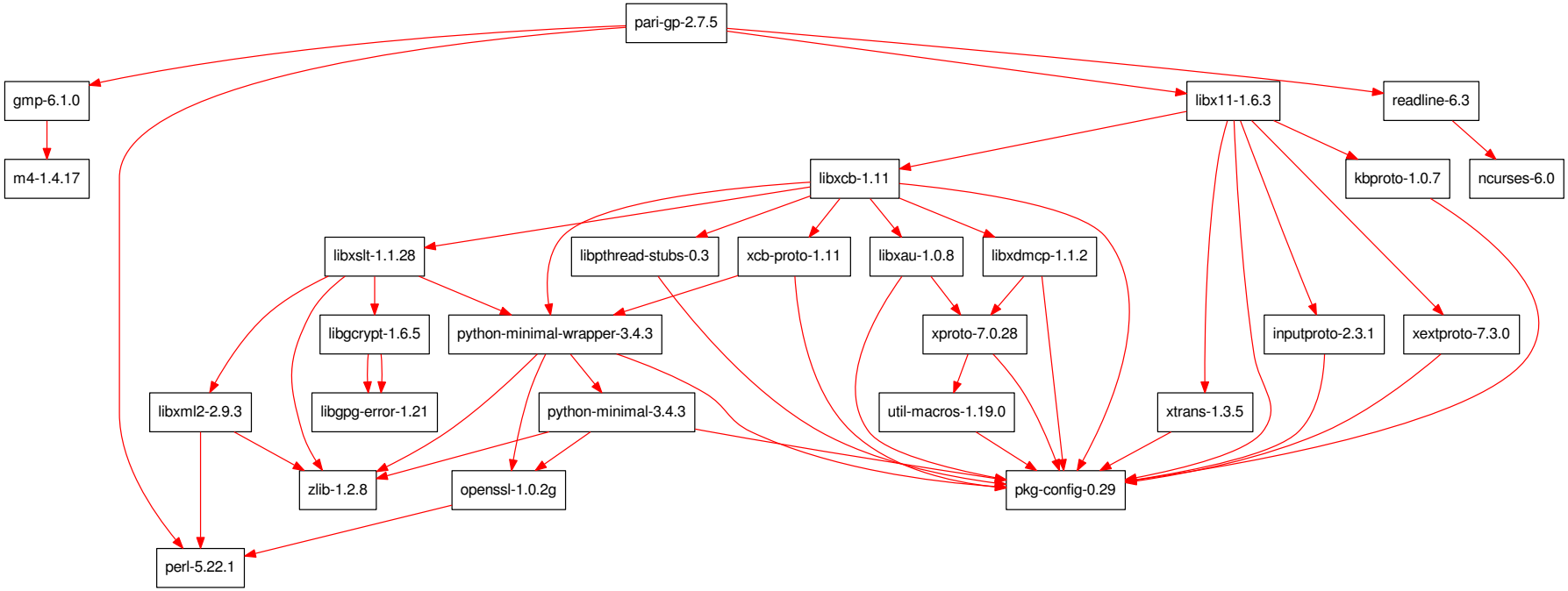
The store


build processes
chroot, separate UIDs
Guile, make, etc.
Guile, make, etc.
Guile, make, etc.
Guile Scheme
(guix packages)
(guix store)
build daemon
RPC

Package recipes

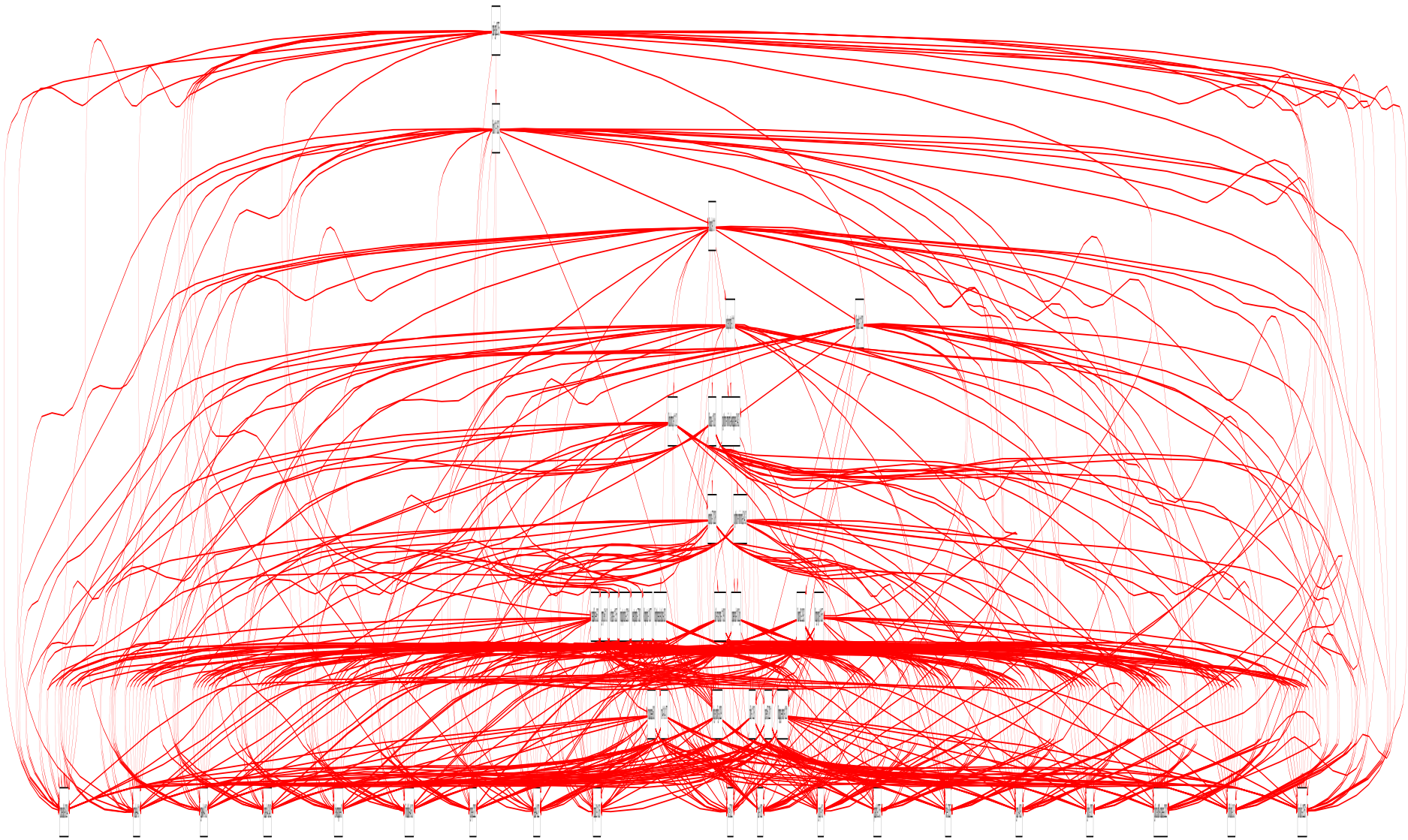
```
(define-public pari-gp
  (package
   (name "pari-gp")
   (version "2.7.5")
   (source (origin
       (method url-fetch)
       (uri "http://pari.math.u-bordeaux.fr/pub/pari/unix/pari-2.7.5.tar.gz")
       (sha256 (base32 "0c8l83a0gjq73r9hndsrzkypwxvnnm4pxkkzbg6jm95m80nzwh11"))))
   (build-system gnu-build-system)
   (inputs `(("gmp" ,gmp)
             ("libx11" ,libx11)
             ("perl" ,perl)
             ("readline" ,readline)))
   (arguments
    '(#:make-flags '("gp")
      #:test-target "dobench"
      #:phases (modify-phases %standard-phases
       (replace 'configure
         (lambda* (#:key outputs #:allow-other-keys)
           (system* "./Configure"
                    (string-append "--prefix=" (assoc-ref outputs "out"))))))))
   (license license:gpl2+)
   (home-page "http://pari.math.u-bordeaux.fr/")))
```

guix graph -type=packages pari-gp



And gcc, make and so on? Implicit inputs!

guix graph -type=bag-emerged pari-gp



Demo: Packages and profiles

- `guix build pari-gp`

  `/gnu/store/qbb9f5s6xzbgac9f260g16b68j7w1wqb-pari-gp-2.7.5`

  Hash of all inputs!

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  Look at `$HOME/.guix-profile`; run `gp`.

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- `./pre-inst-env guix edit pari-gp`
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- `guix package -l`

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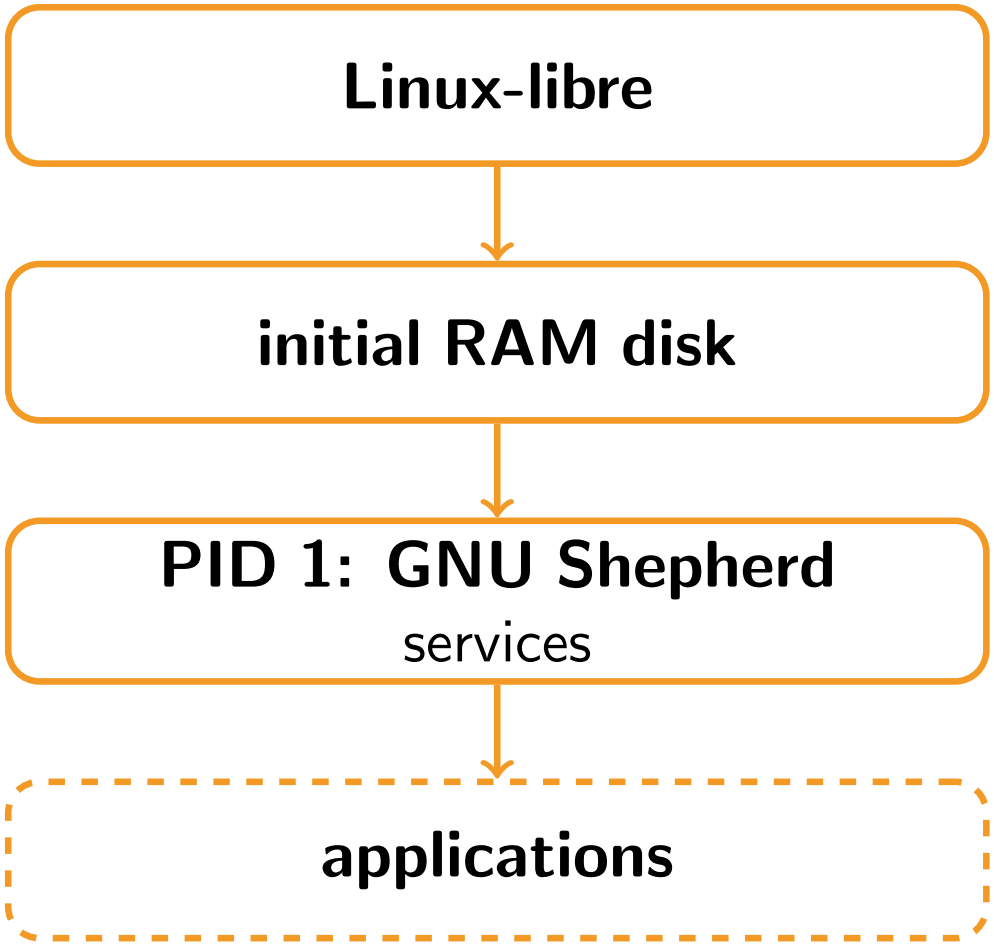
- `guix package -l`
- `guix package --roll-back`

Features

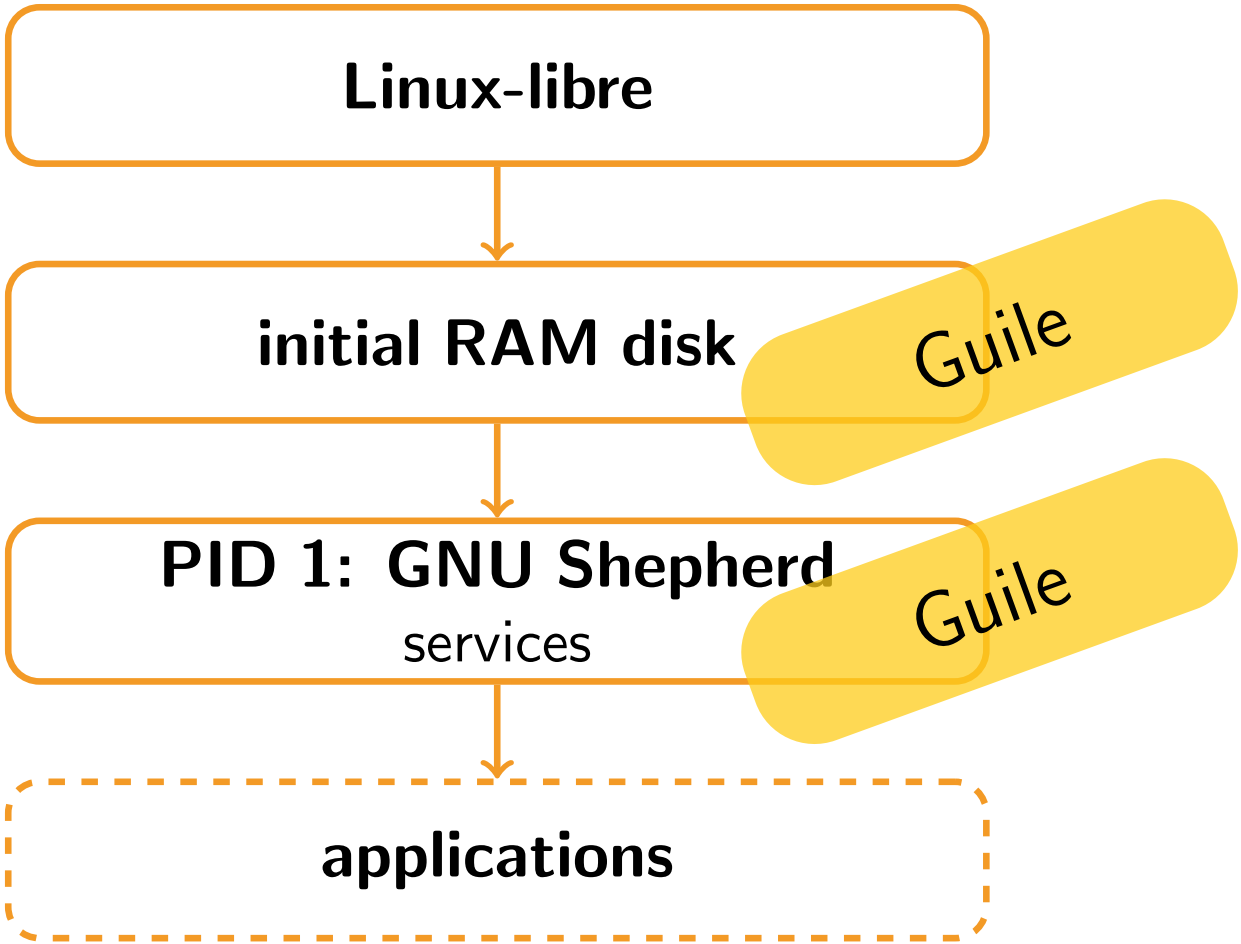
- Hackable
  - based on Guile Scheme
- Dependable
  - immutable packages in store
  - transactional upgrades and downgrades
- Liberating
  - user centric: every user has an individual profile
  - transparent (and reproducible?) binary and source deployments
  - easy roll-back
  - different versions can co-exist
    - ★ in one user profile (?)
    - ★ for different users
    - ★ for one user in different profiles

Packaging and deploying with GNU Guix and GuixSD

System layers



System layers



Demo: Always change a running system!

Have a look at

`/run`

`/run/current-system`

`/run/booted-system`

`/run/current-system/`

Demo: Do as you please!

- Look at `config-desktop.scm`.

Demo: Do as you please!

- Look at `config-desktop.scm`.
- Change!
  - change locales
  - add pari-gp package to global list
  - auto-login the user `enge`

Demo: Do as you please!

- Look at `config-desktop.scm`.
- Change!
  - change locales
  - add pari-gp package to global list
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- `guix system vm config-pari.scm`

Demo: Do as you please!

- Look at `config-desktop.scm`.
- Change!
  - change locales
  - add pari-gp package to global list
  - auto-login the user enge
- `guix system vm config-pari.scm`
- `guix system reconfigure config-pari.scm`

Packaging and deploying with GNU Guix and GuixSD

Timeline

- 2012-11: GNU project by Ludovic Courtès
- 2013-01: release 0.1
- 2014-07: installable operating system
- 2015-01: ARMv7 port
- 2016-01: successful fundraiser for new build farm
- 2016-02: creation of Guix Europe,
  non-profit organisation to support GNU Guix
- 2016-03: release 0.10.0

Status and activities

- 3200 packages
- 4 platforms
  - GuixSD: x86_64, i686
  - Guix as package manager: mips64el, armhf
- $\approx$ 25 contributors per month
- $\approx$ 400 commits per month
- lots of friendly people on the mailing list and on IRC

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Try it out!

- `https://gnu.org/software/guix/`
- It is free
  - as in libre
  - of cost
  - of risk

The source of this document is available from http://git.sv.gnu.org/cgit/guix/maintenance.git.