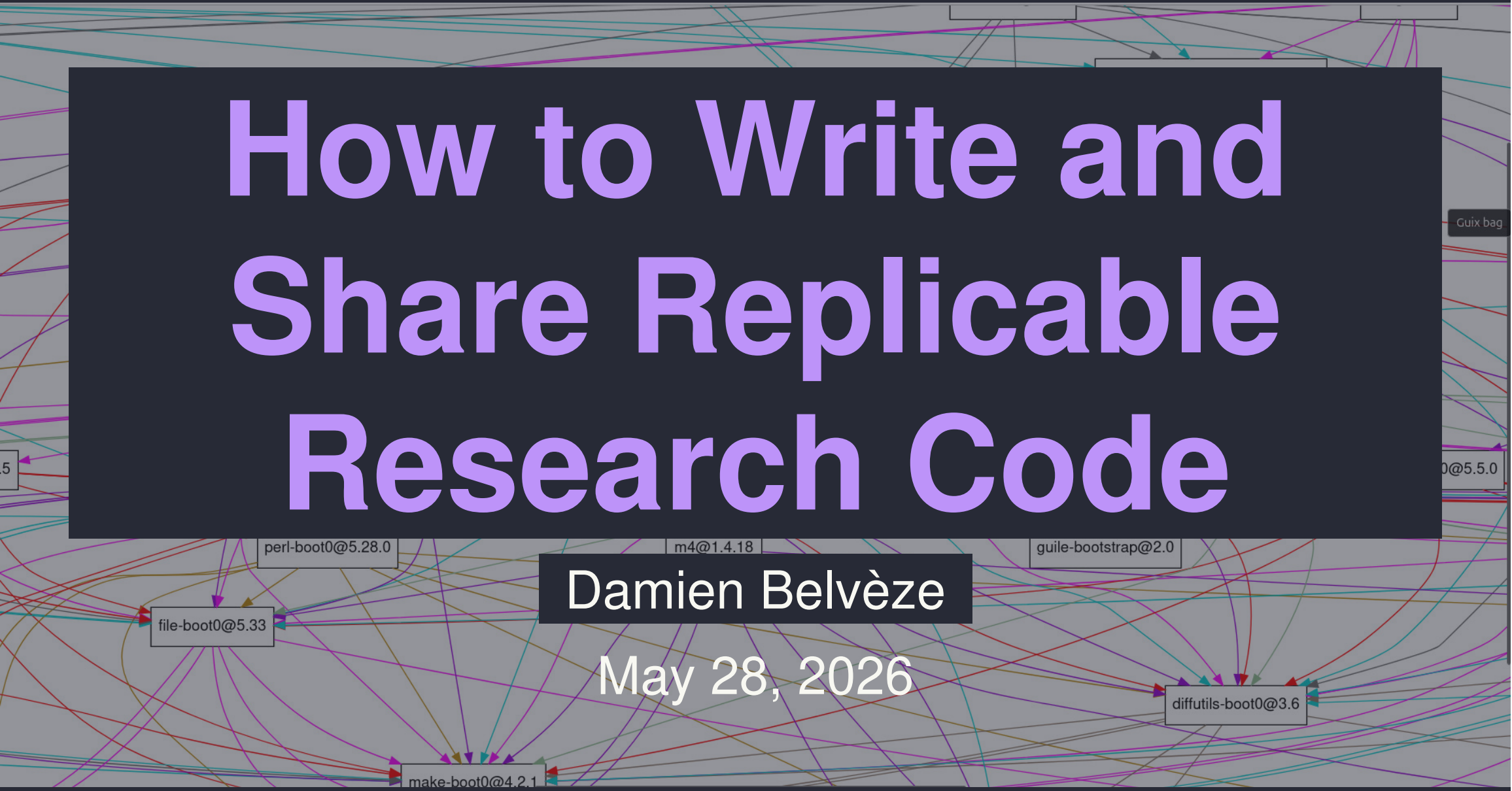
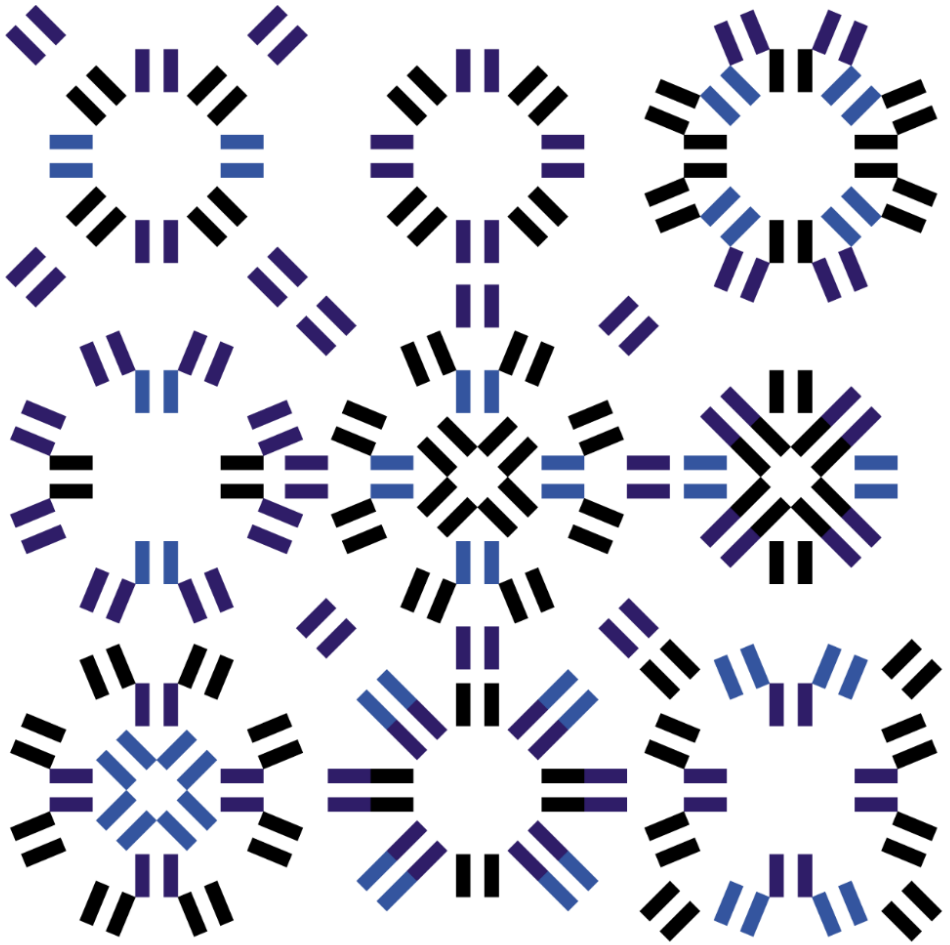


How to Write and Share Replicable Research Code

Damien Belvèze

May 28, 2026

Université de Rennes



How to Write and Share Replicable Research Code

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what is actualy doing Open Science

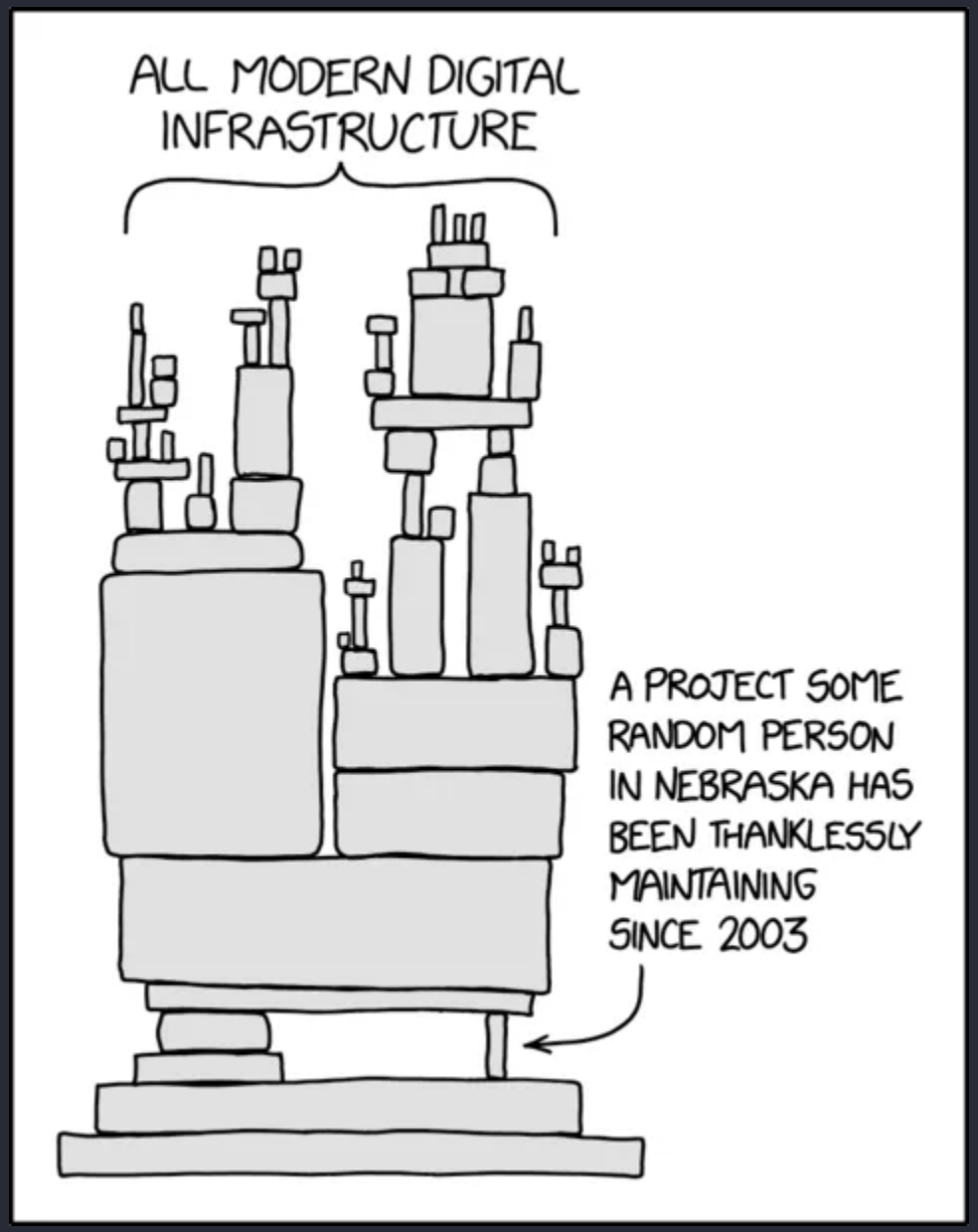
Open Science is about :

- sharing things by making them findable and accessible
- adapting them to existing artifacts (interoperability)
- preparing and documenting them so they could be reused (reusability)
- opening them to contribution (specific for source code)

a source code is static…

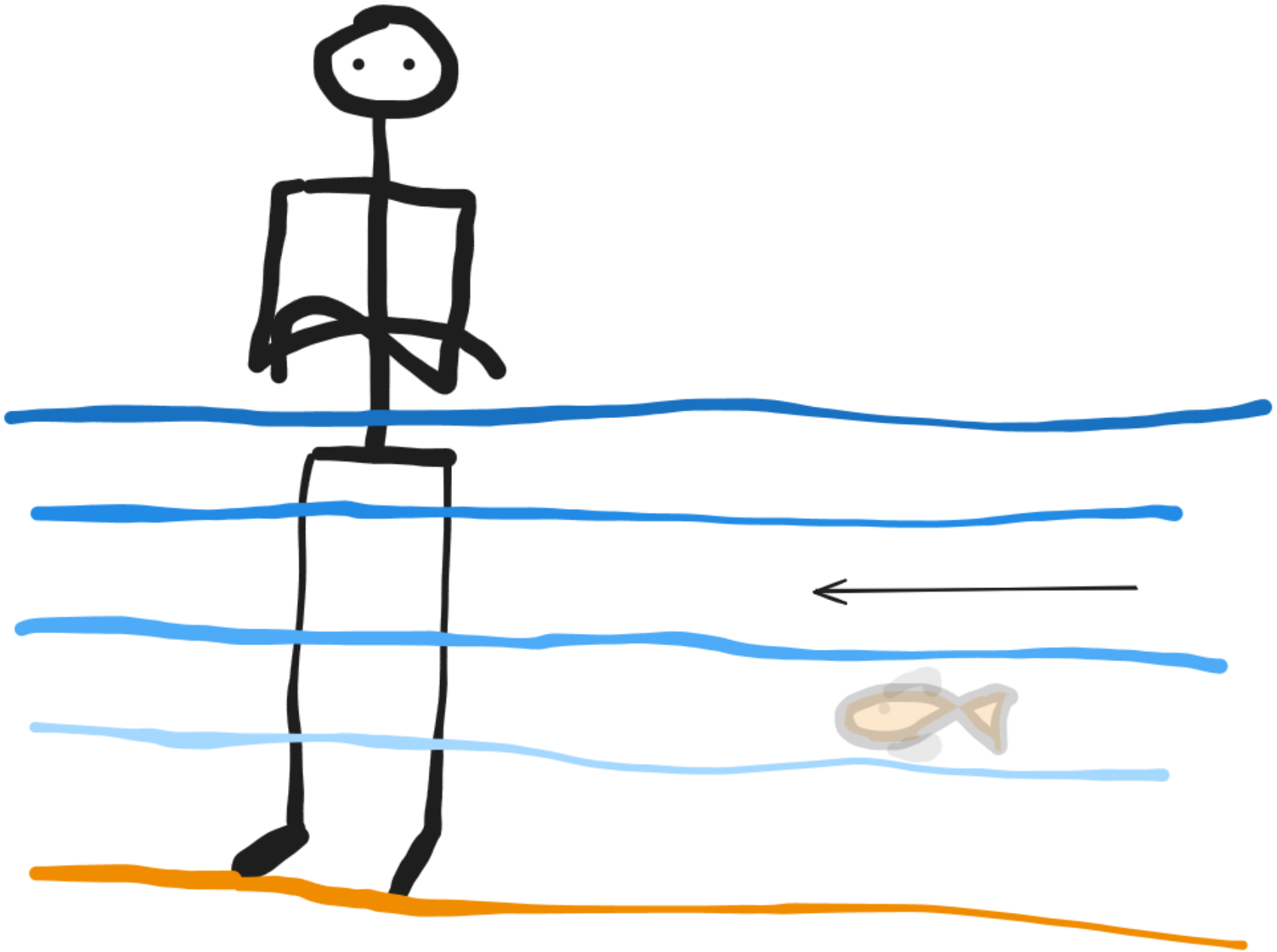
…but the environment which it’s designed for is moving quickly…

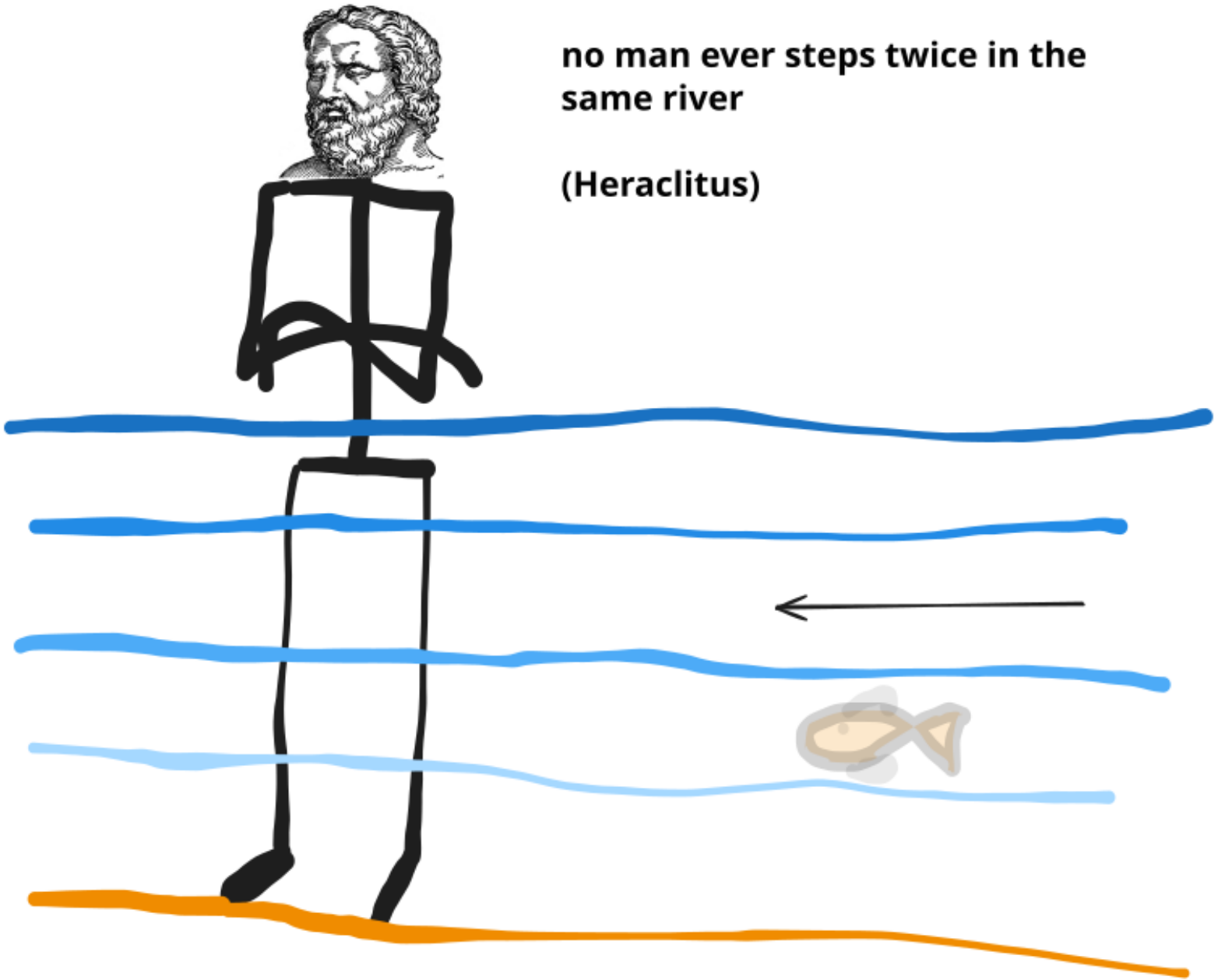
…creating code is like building house of cards grounded on sand



“In modern software there are always dependencies. No one spells out the ones and zeros for the machine by hand, so we write towers of software built on towers of software built on towers of software. And these dependencies change”

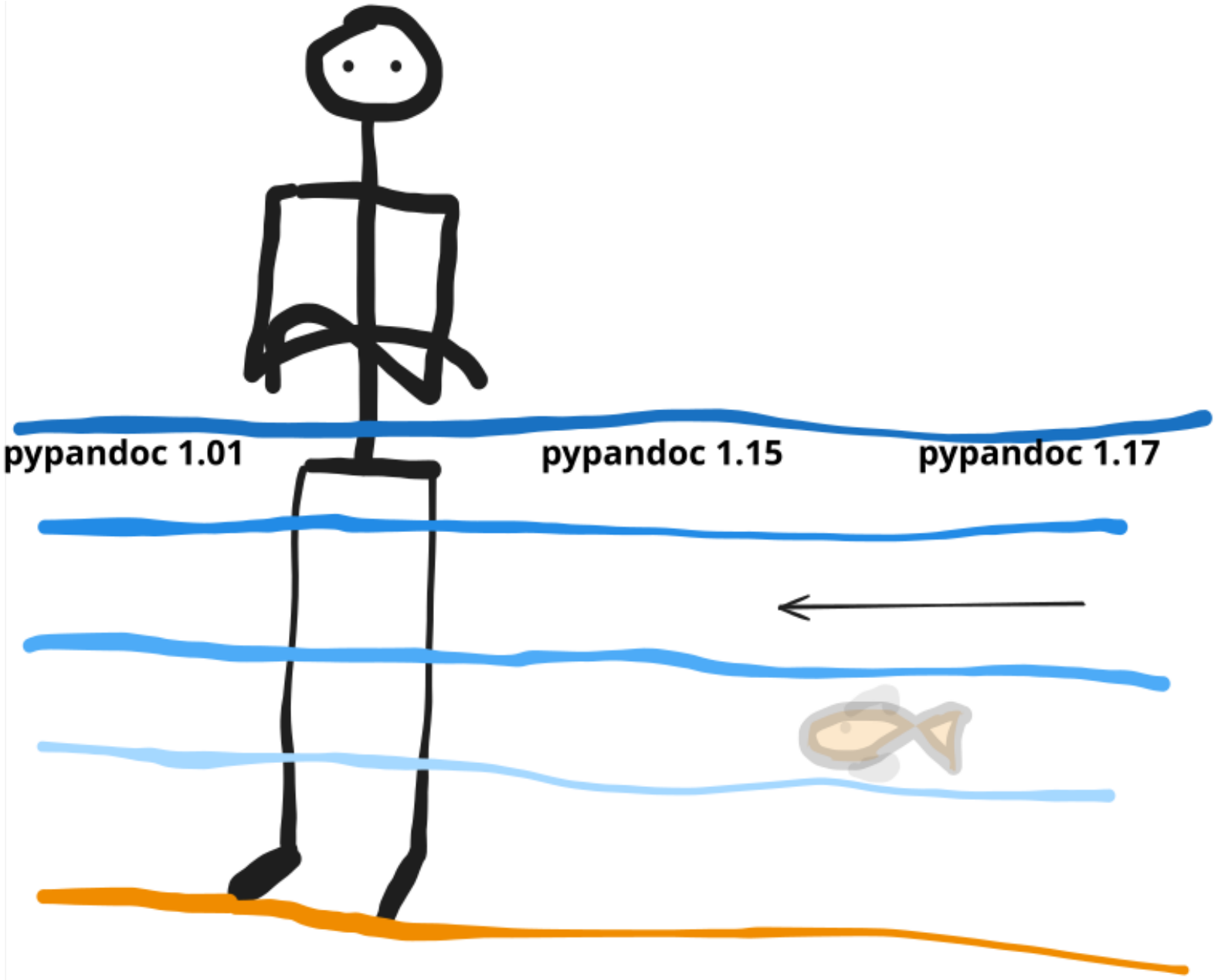
Fobbe (2024)





no man ever steps twice in the same river

(Heraclitus)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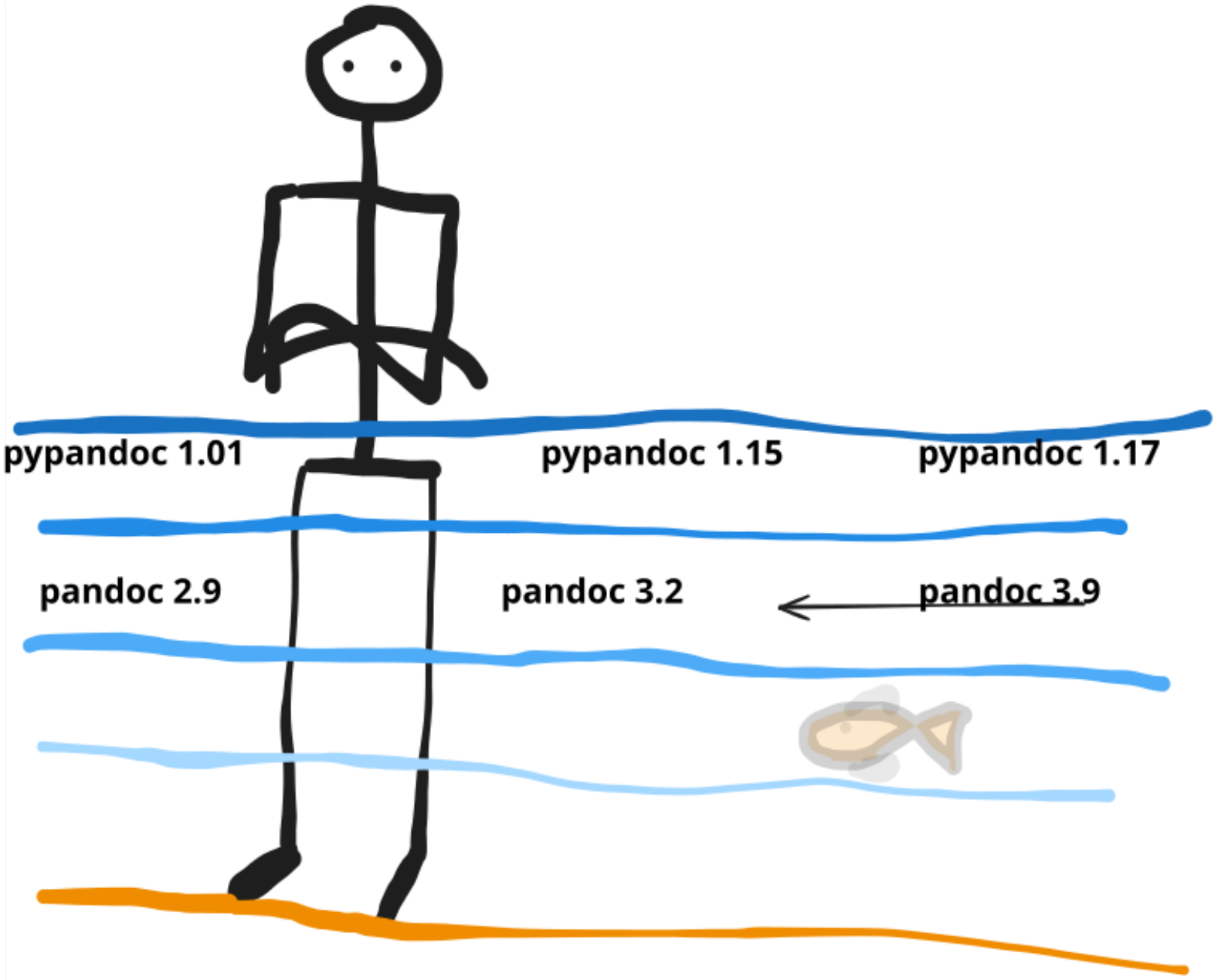
pypandoc 1.17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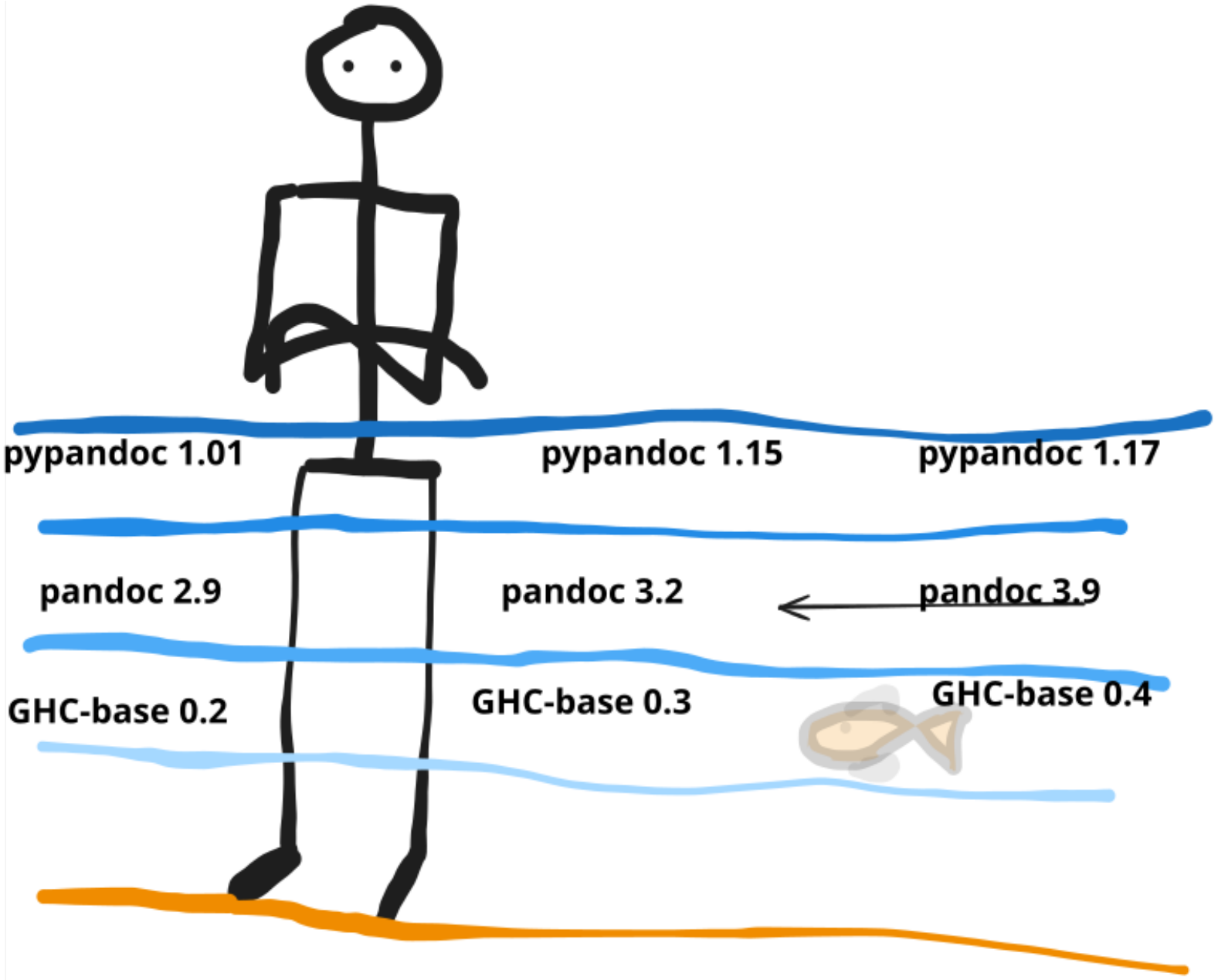
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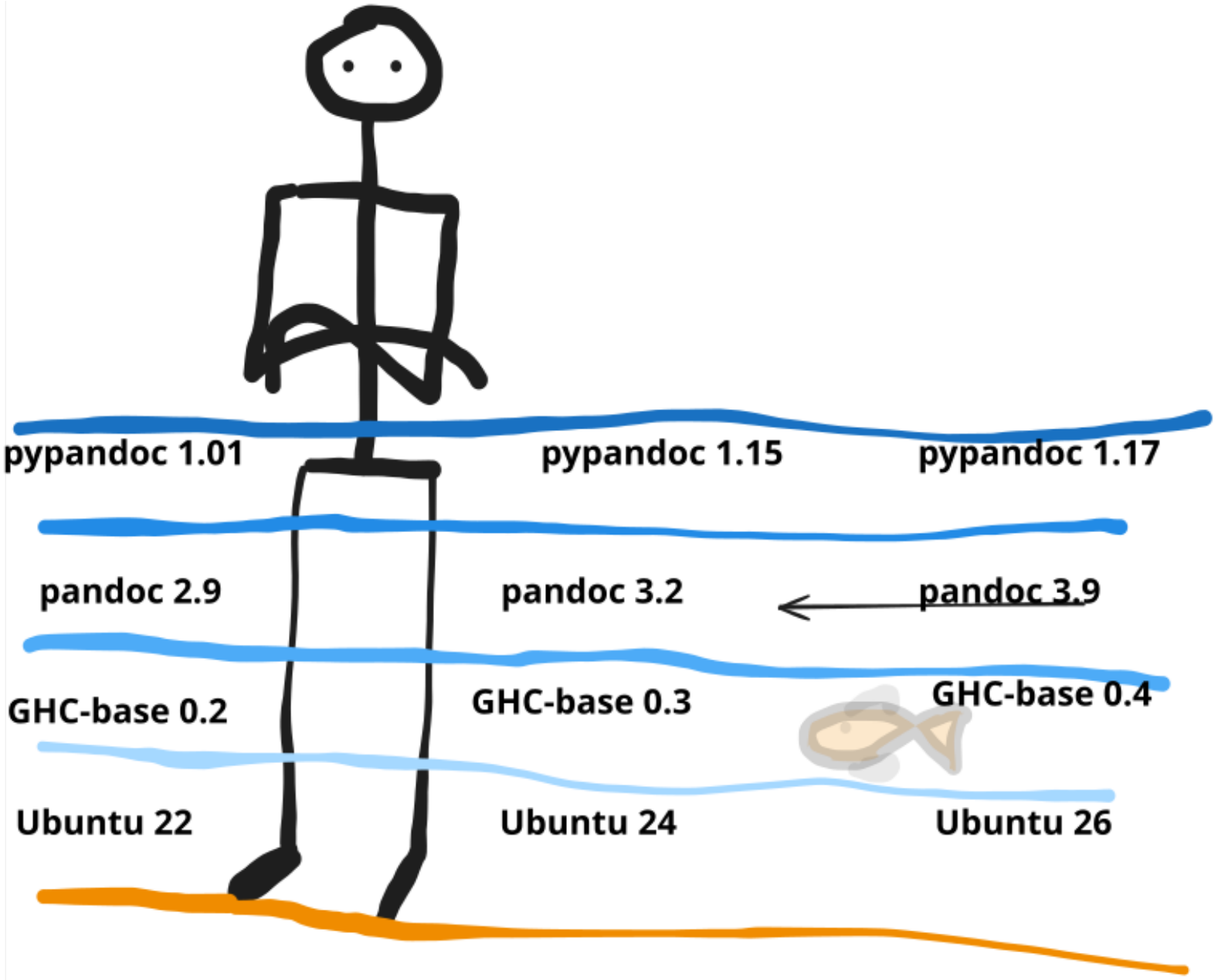
GHC-base 0.2
GHC-base 0.3
GHC-base 0.4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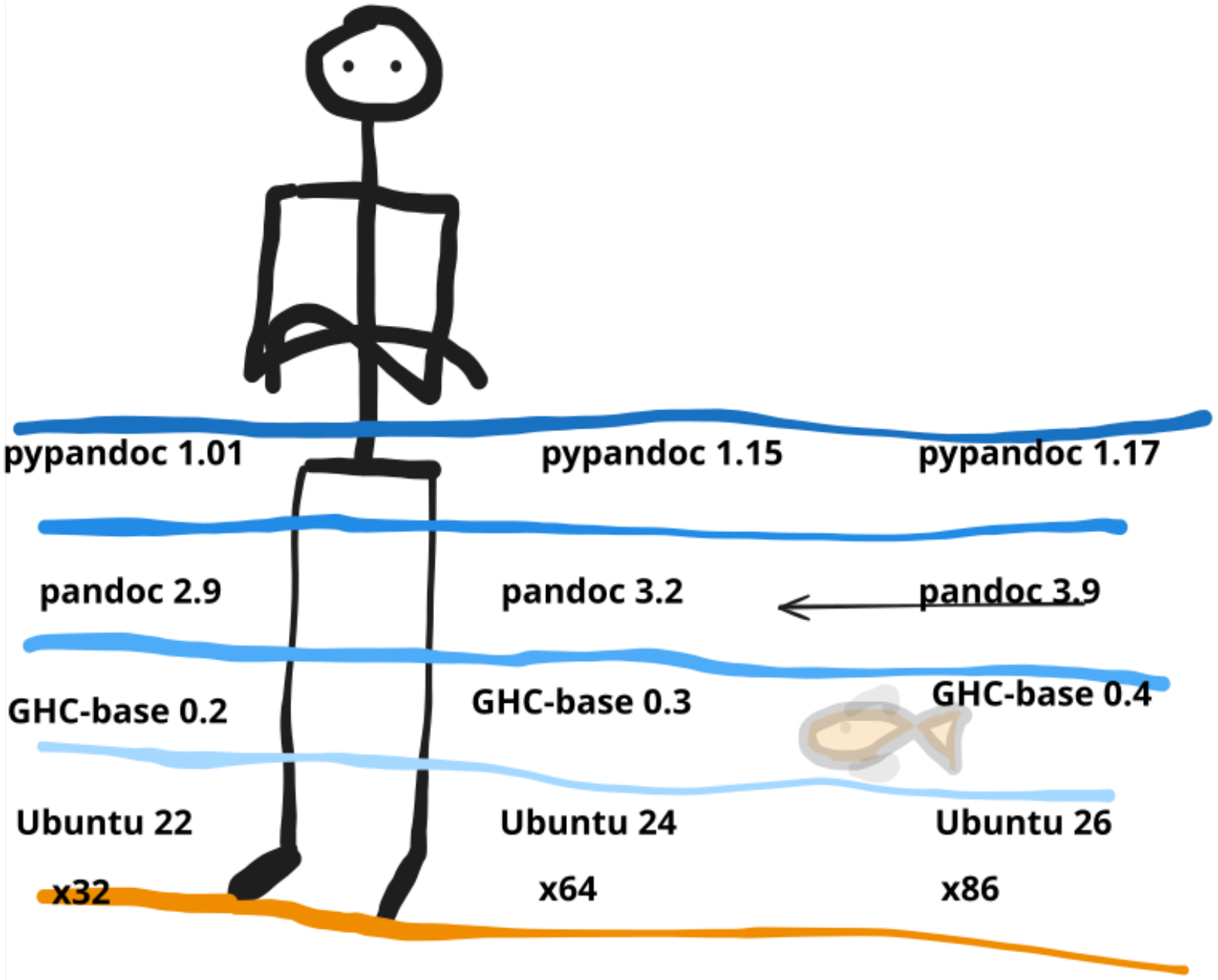
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Ubuntu 24
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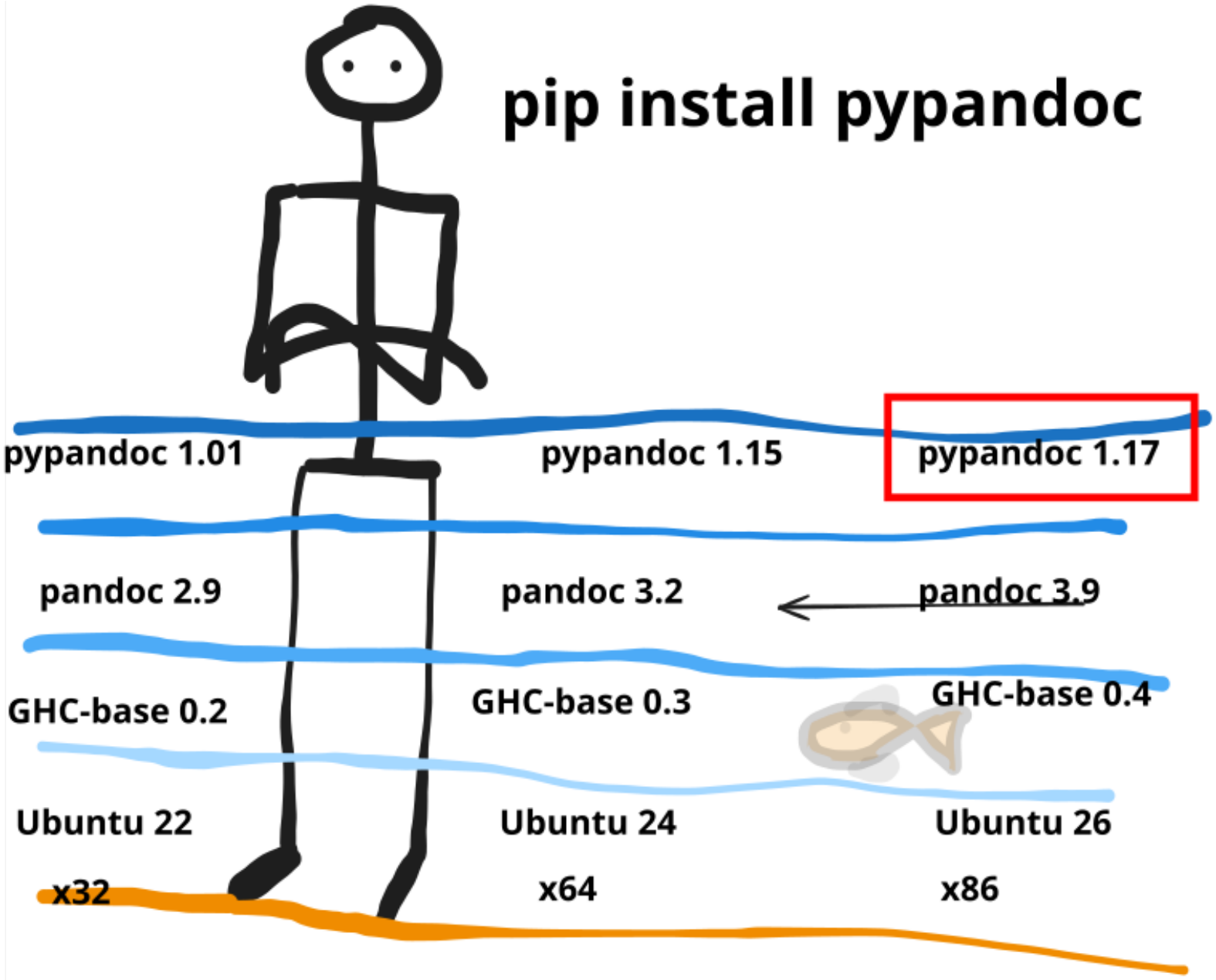
x32
x64
x86


pip install pypandoc
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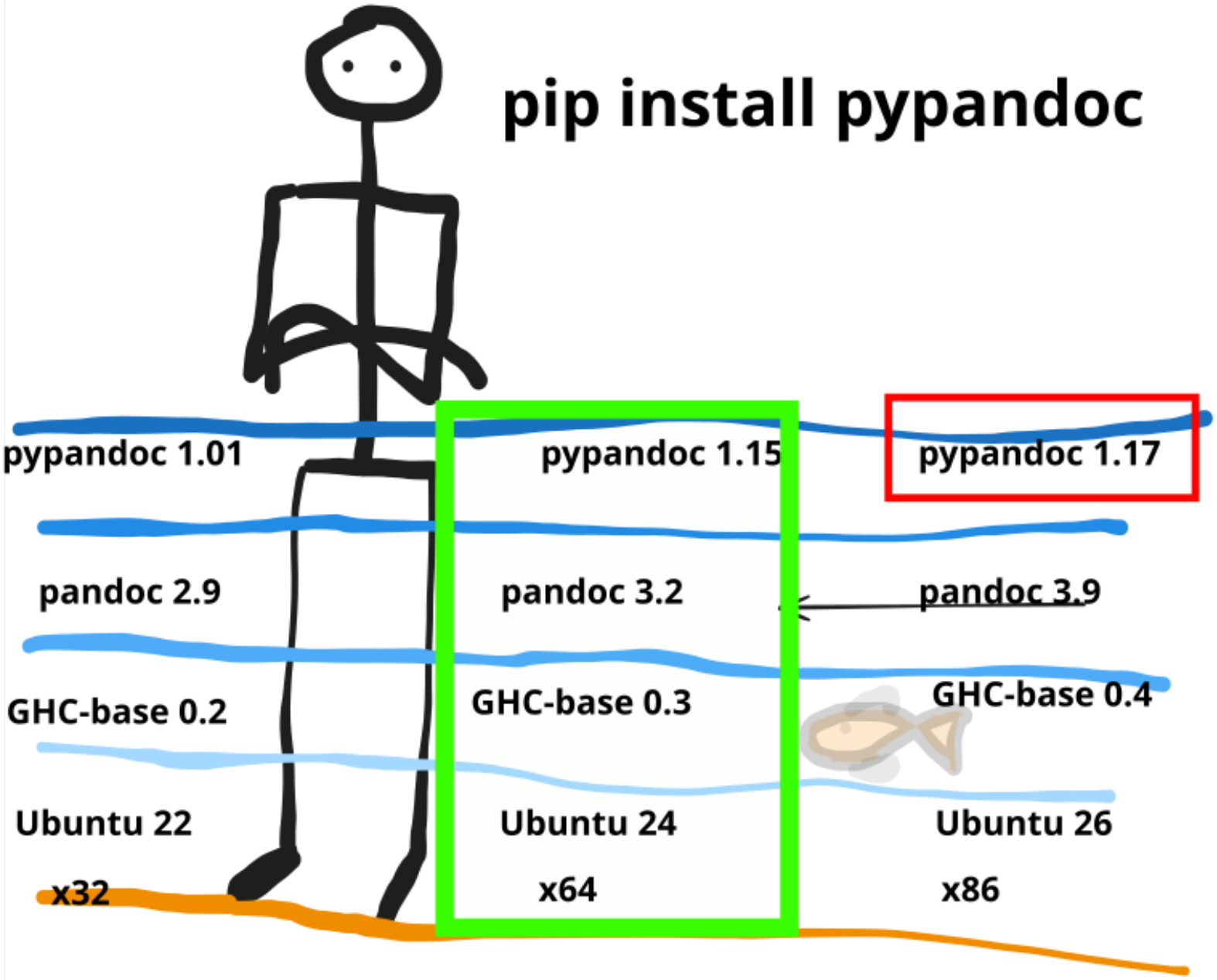
pip install pypandoc
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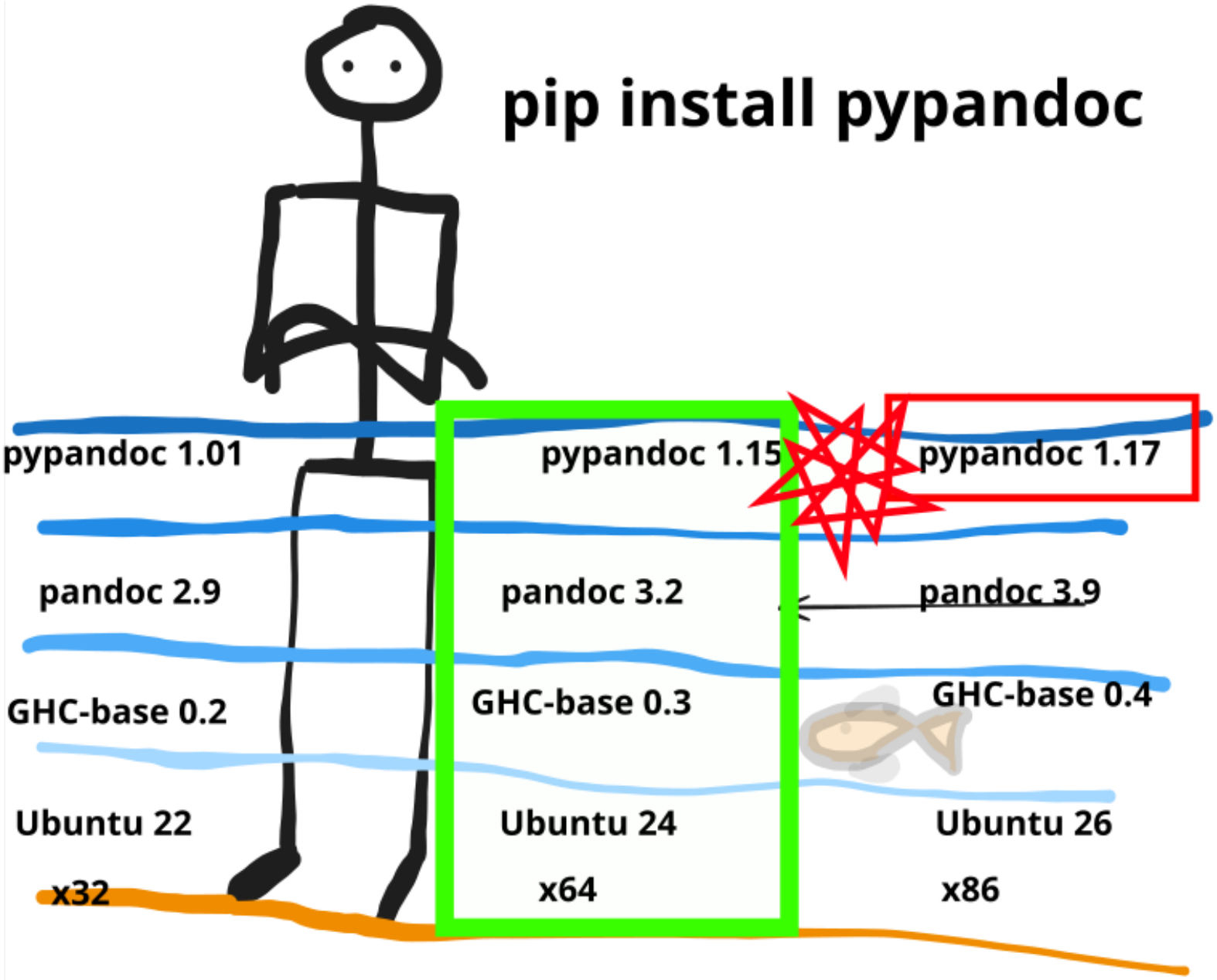
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pandoc 2.9
pandoc 3.2
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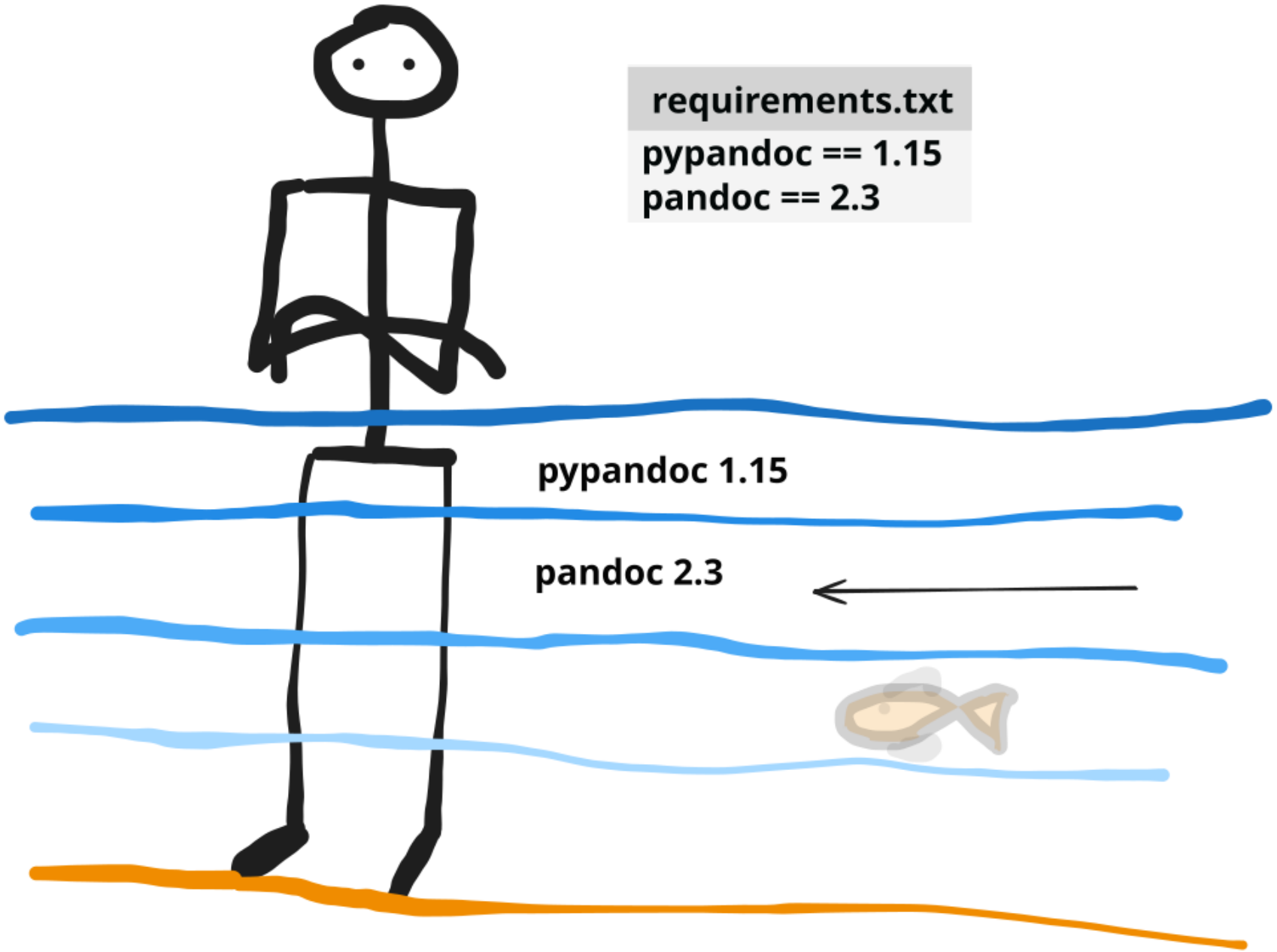
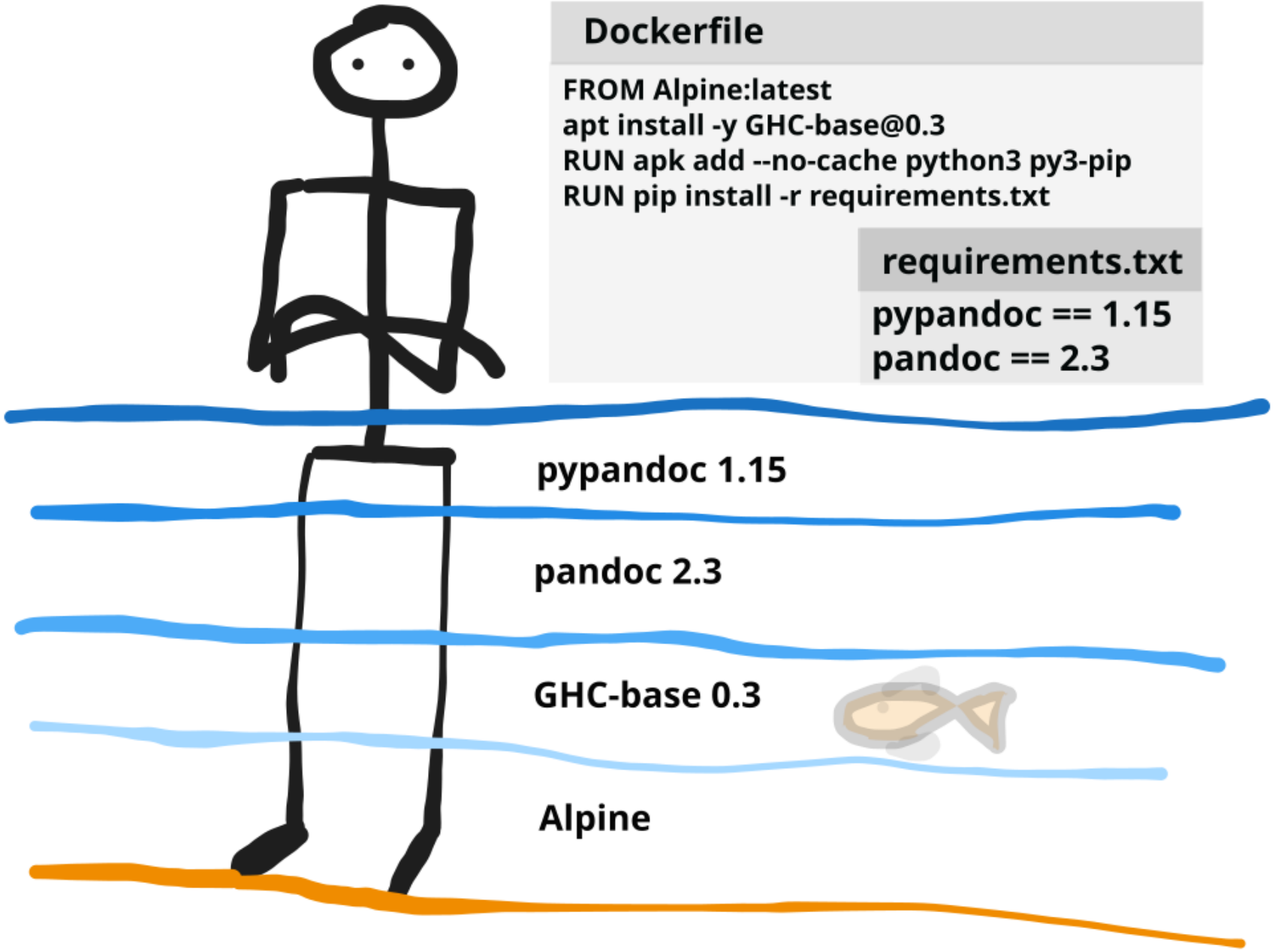
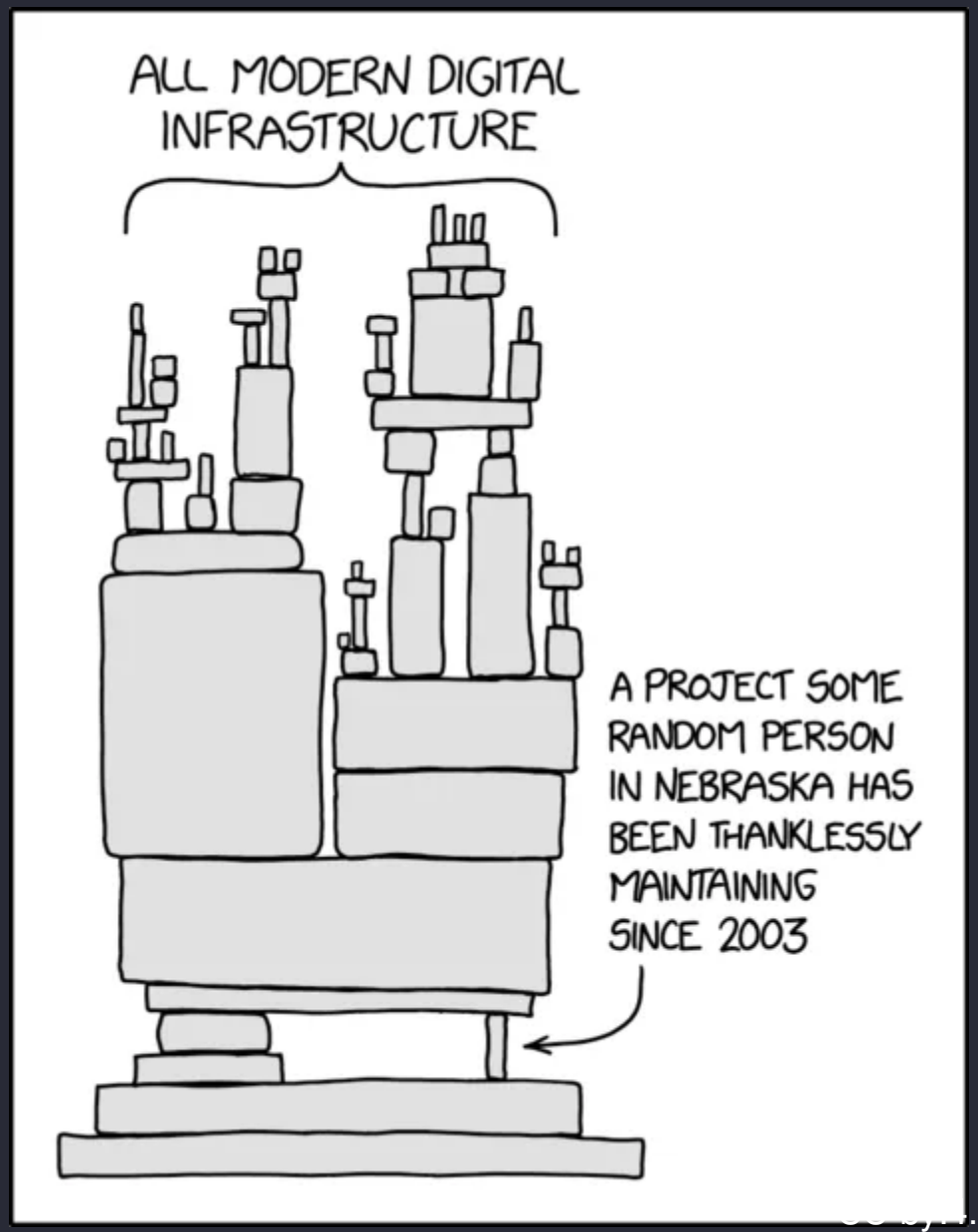

requirements.txt
pypandoc == 1.15
pandoc == 2.3
pypandoc 1.15
pandoc 2.3


Dockerfile
FROM Alpine:latest
apt install -y GHC-base@0.3
RUN apk add --no-cache python3 py3-pip
RUN pip install -r requirements.txt
requirements.txt
pypandoc == 1.15
pandoc == 2.3
pypandoc 1.15
pandoc 2.3
GHC-base 0.3
Alpine

when older versions of dependencies disappear



- they might disappear from the language repositories (Pypi)
- they can also disappear from the forges where they were stored
- and new versions appear to be non compatible with other components (such as in our example)

Guix as a package manager offers solutions to those prooblems

- Guix provides fully consistent *computational environments* in only two config files (*manifest* and *channels*)
- these config files track all packages used with their own version and the dependencies to these packages
- if a dependency cannot be found online anymore, a fall-back system links missing components to their archived counterparts in Software Heritage (1)
- Guix can be used on Windows through WSL2
- guix allows to run on a single computer a script with different versions of the same package without any conflict
- for non-guix users, guix easily packages the software into a Docker container (2)

1. Courtès et al. (2024)
2. Tournier (2024)

example

```
(define-module (r-gristapi)
  #:use-module ((guix licenses) #:prefix license:)
  #:use-module (guix packages)
  #:use-module (guix build-system gnu) ;; pertinent ici ?
  #:use-module (gnu packages cran)  ;; pour installer les dépendances indiquées dans propagated-inputs
  #:use-module (gnu packages statistics)
  #:use-module (gnu packages geo)  ;; spécifique pour sf ?
  #:use-module (guix download) ;; pour télécharger un fichier depuis github
  #:use-module (guix build-system r)) ;; pour compiler des packages de R ?

(define-public r-gristapi
 (package
  (name "r-gristapi")
  (version "0.1.0")
  (source (origin
        (method url-fetch)
        (uri (string-append "https://github.com/spyrales/gristapi/archive/refs/tags/v0.1.0.tar.gz"))
        (sha256
         (base32
          "01jljdsj4qn7rjaxw3pvyyrw10r3zydf6v904lzvw8dbkzlj26i1"))))
  (build-system r-build-system)
  (propagated-inputs
   (list r-assertthat r-dplyr r-httr2 r-jsonlite r-magrittr r-r-methodss3 r-purrr r-r6 r-rlang r-sf r-tibble r-tidyr r-tidyselect))
  (synopsis "gristapi communicates from R with a Grist document using Grist api ")
  (description
   "The package provides an R6 class to connect to a Grist document (which contains multiple tables), and a set of functions to interact with the document.")
  (home-page "https://github.com/spyrales/gristapi")
  (license license:eupl1.2)))

r-gristapi
```

how guix should build it

under which name this package will be found in guix package manager

where are the sources that should be built, which unique version

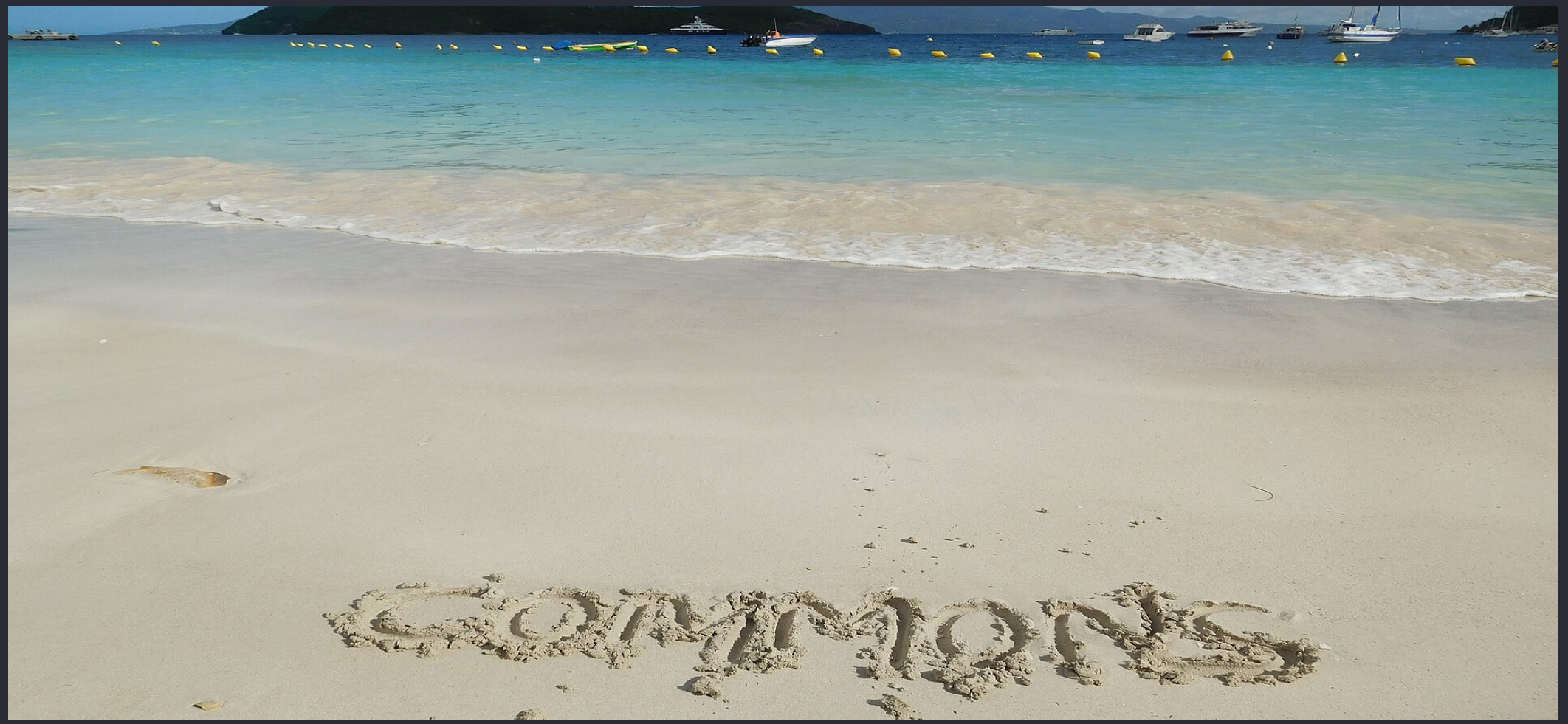
which dependencies should be used to successfully build the source code

Guix users need only two config files to reproduce the environment or a past experience :

- **manifest.scm** : enumerate all the dependencies (system and software)
- **channels.scm** : defines their exact version

```
1 guix time-machine --channels=channels.scm -- shell --manifest=manifest.scm
2 -- Rscript myscript.R
```

Thanks to Guix maintainers, writing code feels a bit less like “writing in the sand”



references

Courtès, L., Sample, T., Tournier, S., & Zacchiroli, S. (2024, June). Source code archiving to the rescue of reproducible deployment. *Proceedings of the 2024 ACM Conference on Reproducibility and Replicability, Proceedings of the 2024 ACM Conference on Reproducibility and Replicability*. https://doi.org/10.1145/3641525.3663622

Fobbe, S. (2024). *The Limits of Reproducibility with Rocker Docker Images for R* (posts). https://seanfobbe.com/posts/2024-12-16_reproducibility-limits-rocker-docker-images-r/.

Tournier, S. (2024, December). (Re)déploiement de conteneurs et machines virtuelles avec guix. *JRES (Journées Réseaux de l'enseignement Et de La Recherche) 2024*.