A Gentle Introduction to Nix

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What is Nix

- language (functional)
- operating system (NixOS)
- package manager

Pure functions

|———| **a** -> | **machine** | -> **b** |———|

- A mapping of **a's** to **b's**
- Every **a** always results in the same **b**
- Morally equal to a **HashMap a b**

Building software

|——| **simple.c** -> | **gcc** | -> **.exe** |——|

- The machine has gcc "inside it"
- Altering gcc in the machine alters the build function
- Hence impure build

Nix

gcc -> |———| | **machine** | -> **.exe simple.c** -> |———|

- gcc is now an argument

- The build function is pure again
- Hence the build is pure

What do you mean gcc is an argument

- gcc is called a **derivation** here
- derivations can be built by fetching source and building it
- fetchers can fetch a source from .tar.gz or GitHub
- nixpkgs has recipes for **derivations** of a lot of tools

Language

- Purely functional
- Dynamically typed
- Weird at first

Language example

```
let
  increase = x: x + 1;
  myList = [ 2 "world" false ];

in { result = "Hello ${builtins.elemAt myList 1}"; }
```

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nixpkgs

- A collection of derivations and functions
- Can be used in nix-expressions
- Gives a specific version of e.g. gcc

Back to the pure build

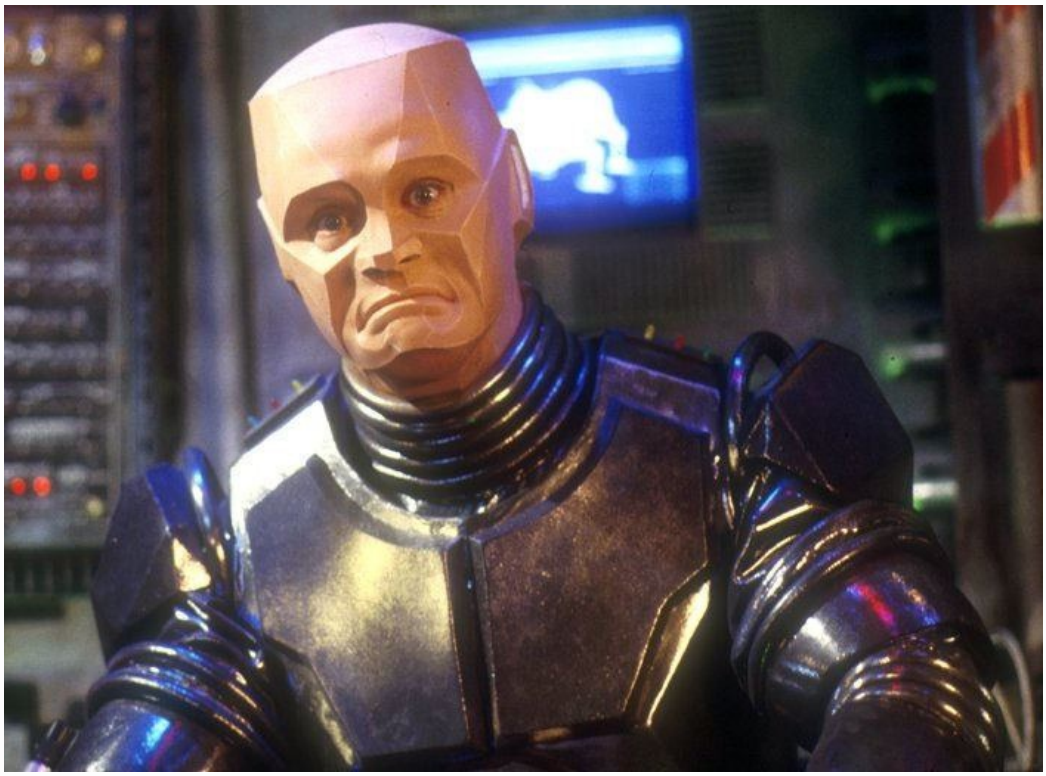
simple.c

```
void main() {
  puts("Simple!");
}
```

build.sh

```
> gcc -o simple simple.c
```

An excellent suggestion, sir, with just two minor drawbacks



The nix way

```
> $gcc -o simple $src
```

.nix example

build.nix

```
let
  nixpkgs = (import (builtins.fetchTarball {
    url =
      "https://github.com/NixOS/nixpkgs/archive/d1c3fea7ecbed758168787fe
    sha256 = "sha256:0ykm15a690v8lcqf2j899za3j6hak1rm3xixdxsx33nz7n3swsy
  })) { };

  pureBuildFunction = pkgs : src : system :
    with pkgs;
     derivation {
      name = "simple";
      builder = "${bash}/bin/bash";
      args = [ ./builder.sh ];
      inherit src system gcc coreutils;
    };

in pureBuildFunction nixpkgs ./simple.c "x86_64-darwin"
```

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build-script

builder.sh

```
export PATH="$coreutils/bin:$gcc/bin"
mkdir $out
gcc -o $out/simple $src
```

Let nix build our code

```
> nix-build build.nix
/nix/store/a22p8f72pghn22w168a72pisicnncmmh-simple

> /nix/store/a22p8f72pghn22w168a72pisicnncmmh-simple/simple
Simple!
```

The nix shell

Allows any nixified package to be brought into the shell

```
> nix-shell -p python2 python3 -I nixpkgs=https://github.com/NixOS/nixpk
```

Will put me in a shell with python2 and python3

```
nix-shell> python2 --help
nix-shell> python3 --help
```

Upsides

- reproducible builds
- does not alter your entire system (only your nix-store)
- you can have every version of python available without conflicts
- efficient caching
- build small, reproducible docker-images
- easily override e.g. gcc with an unmerged PR

Downsites

- language can be weird
- long build times from empty caches
- docs can be.. sparse
- disk use can be.. significant

No time to talk about

- Nix flakes
- NixOS

Thanks!

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