

Nix & NixOS

pour la robotique

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Available at

[https://homepages.laas.fr/gsaurel/talks/
nix-rob.pdf](https://homepages.laas.fr/gsaurel/talks/nix-rob.pdf)

[https://gitlab.laas.fr/gsaurel/talks :
nix-rob.md](https://gitlab.laas.fr/gsaurel/talks:nix-rob.md)

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Introduction

- robotpkg

- robotpkg
- cmake-wheel

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- cmake-wheel
- PID



Cahier des charges

- source
- binaires

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- binaires
- cache

Mêmes sources + recette => mêmes résultats

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- OS (eg. macos / linux)
- CPU (eg. x86_64 / arm64)
- Compilateur (eg. gcc / clang)
- Environnement
- Options automatiques

=> Isolation

L'Enfer.

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- versions
- ld
- python
- etc.

- Paquets système
- Environnements de travail

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- Environnements de travail

droits

- Et si on changeait l'implémentation de BLAS ?
- Et si on utilisait on recompilait tout avec LLVM ?
- Et si on passait à `-march=native` ?
- Et si on désactivait les mitigations downfall ?
- Et si on modifiait un flag du noyau ?

Ref. Own your CI with Nix. FOSDEM, Hufschmitt (2024)

La solution

Ref. The purely functional software deployment model. PhD,
Dolstra (2006)

```
stdenv.mkDerivation rec {  
  pname = "hello";  
  version = "2.12.1";  
  
  src = fetchurl {  
    url = "mirror://gnu/hello/hello-${version}.tar.gz";  
    hash = "sha256-jZkUKv2SV28wsM18tCqNxoCZmLxdYH2...=";  
  };  
  
  doCheck = true;  
})
```

```
nix-repl> pkgs.hello  
«derivation /nix/store/img71klf2wzx867q5ldhf0zqc3wl0m  
hello-2.12.1.drv»
```

```
nix-repl> "${pkgs.hello}"  
"/nix/store/bw9z0jxp5qcm7jfp4vr6ci9qynjyaaip-  
hello-2.12.1"
```

```
$ tree /nix/store/bw9...-hello-2.12.1
```

```
bw9...-hello-2.12.1/
```

```
├── bin/
│   └── hello*
├── share/
│   ├── info/
│   │   └── hello.info
│   ├── locale/
│   │   └── [...]
│   └── man/
│       ├── man1/
│       │   └── hello.1.gz
```

```
$ ldd /nix/store/bw9...-hello-2.12.1/bin/hello
linux-vdso.so.1 (0x00007fab657f1000)
libc.so.6 => /nix/store/35p...-glibc-2.39-5/lib/libc.so.6
/nix/store/35p...-glibc-2.39-5/lib/ld-linux-x86-64.so.6
```


- 100k paquets
- 7k contributeurs
- 3k mainteneurs
- 630k commits
- 20 ans

- dépôt git + flake.nix
- entrées: autres flakes
- sorties:
 - paquets
 - applications
 - tests
 - dev shells
 - NixOS configurations

```
laas-beamer-theme = pkgs.stdenvNoCC.mkDerivation {
  name = "laas-beamer-theme";
  src = ./.;
  outputs = [ "tex" ];
  installPhase = ''
    path="$tex/tex/latex/laas-beamer-theme"
    mkdir -p "$path"
    cp *.{png,sty} "$path/"
  '';
  meta = {
    description = "My LAAS beamer theme";
    homepage = "https://gitlab.laas.fr/gsaurel/laas-";
    license = pkgs.lib.licenses.cc-by-sa-40;
    maintainers = [ pkgs.lib.maintainers.nim65s ];
  };
};
```

```
gsaurel-talks = stdenvNoCC.mkDerivation {
  name = "gsaurel-talks";
  src = ./.;
  nativeBuildInputs = [ source-code-pro
    source-sans source-serif ];
  buildInputs = [
    pandoc
    (python3.withPackages (p: [ p.pyyaml ]))
    (texlive.combined.scheme-full.withPackages(
      _: [ laas-beamer-theme ]))
  ];
  installPhase = ''
    mkdir $out
    cp public/*.{pdf,html} $out
  '';
};
```

NixOS

Ref. ROS2 deployment with Docker and BalenaOS. ROSConFr, Chataignon (2023):

Deploying on Robot/embedded device wishlist:

- *Easy updates/rollback*
- *Same code/binary on all devices*
- *No user interaction installation*

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But **ROS => ubuntu**

```
{
  imports = [ ./hardware-configuration.nix ];
  boot.loader.systemd-boot.enable = true;
  networking.hostName = "loon";
  networking.networkmanager.enable = true;
  time.timeZone = "Europe/Paris";
  console.keyMap = "fr-bepo";
  users.users.gsaurel = {
    shell = pkgs.fish;
    isNormalUser = true;
    description = "Guilhem Saurel";
    extraGroups = [ "networkmanager" "wheel" ];
  };
  environment.systemPackages = [ pkgs.git pkgs.vim ];
  services.openssh.enable = true;
}
```


Mise à jour / rollbacks atomiques

Robotique



Figure 1: solo

Better ROS Builds with Nix

ROSCon 2022 | Kyoto, Japan



Mike Purvis
DevOps Staff

<https://github.com/mikepurvis>



Ivor Wanders
Navigation Manager

<https://github.com/iwanders>



<https://github.com/lopsided98/nix-ros-overlay>

Communauté: projets

```
home = {  
  packages = [ ... ];  
  home.file = {  
    ".config/dfc/dfcrc".source =  
      ../.config/dfc/dfcrc;  
  };  
  sessionVariables.PAGER = "vim -c PAGER -";  
  programs.atuin = {  
    enable = true;  
    flags = [ "--disable-up-arrow" ];  
  };  
  programs.git = {  
    enable = true;  
    delta.enable = true;  
    lfs.enable = true;  
    userName = "Guilhem Saurel";  
    userEmail = "guilhem.saurel@laas.fr";  
  };  
};
```

```
disko.devices.disk.my-disk = {  
  device = "/dev/sda";  
  type = "disk";  
  content = {  
    type = "gpt";  
    partitions = {  
      ESP = {  
        type = "EF00";  
        size = "500M";  
        content = {  
          type = "filesystem";  
          format = "vfat";  
          mountpoint = "/boot";  
        };  
      };  
    };  
  };  
};
```

```
disco.devices.disk.my-disk = {
  device = "/dev/sda";
  type = "disk";
  content = {
    type = "gpt";
    partitions = {
      ESP = { ... };
      root = {
        size = "100%";
        content = {
          type = "filesystem";
          format = "ext4";
          mountpoint = "/";
        };
      };
    };
  };
};
```


Installation automatique

Gestion des secrets par utilisateur et par machine

Communauté: entreprises

- Determinate Systems
- Flox
- Tweak / Modus Create
- Numtide
- Cachix
- Hercules-CI

- Anduril

Communauté: humains

...

Questions ?

Links

- <https://homepages.laas.fr/gsaurel/talks/home-manager.pdf> (enregistrement)
- <https://homepages.laas.fr/gsaurel/talks/nix-rob.pdf>

References

- Chataignon, Alexandre. 2023. *ROS2 Deployment with Docker and Balenaos*. <https://indymotion.fr/w/27cfXhaR5qDtSazXN9Daig>.
- Dolstra, Eelco. 2006. “The Purely Functional Software Deployment Model.” PhD thesis, Utrecht University. <https://edolstra.github.io/pubs/phd-thesis.pdf>.
- Hufschmitt, Théophane. 2024. *Own Your CI with Nix*. <https://fosdem.org/2024/schedule/event/fosdem-2024-2282-own-your-ci-with-nix/>.