

# NIXOS

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# NIXOS

*“... reproducible, declarative and reliable systems.”*





# CONTENT



## **Nix**

- Language
- Package Manager
- OS

# USE CASES

- Reproducible artifacts (apps, environments ...)

```
mkDerivation {  
  name = "myProject-1.0.0";  
  src = ./src;  
  buildInputs = [ python311 poetry ...];  
}
```

- Adhoc environments

```
$ nix shell nixpkgs#poetry nixpkgs#python311  
$ nix run    nixpkgs#poetry
```

# NIX LANGUAGE

## Derivation

```
{
  "/nix/store/dvmidxj5...-myProject-1.0.0.drv": {
    "inputSrcs": [
      "/nix/store/9krlzvn...-default-builder.sh"
    ],
    "inputDrvs": {
      "/nix/store/lpsqjc0l1...-bash-4.4-p23.drv": [
        "out"
      ],
      "/nix/store/8fbvqyx19y...-myProject-1.0.0.tar.gz.drv": [
        "out"
      ],
      "/nix/store/m15naxf2...-stdenv-linux.drv": [
        ...
      ]
    ]
  }
}
```

# NIX LANGUAGE

≈Json + Functions

```
mkDerivation {  
  name = "myProject-1.0.0";  
  src = ./src;  
  buildInputs = [ python311 poetry ...];  
}
```

**Benefits**

- Functional
- Pure  
(almost)
- Declarative

# NIX LANGUAGE

- Numbers 42
- Strings "hello"
- List [1 2 3]
- Expressions 1+2+3
- Attribute Sets { key = value; ... }
- Let Bindings **let** x = ... in ...
- Functions f x



# ATTRIBUTE SET

```
{  
  myNumber    = 3;  
  myAttrSet   = { name = "myProject-1.0.0"; src = ... };  
  myString    = otherAttrSet.nestedSet.name;  
  myFunction  = x: 2*x;  
}
```

```
{  
  name        = "myProject-1.0.0";  
  src         = ./src;  
  buildInputs = [ python311 poetry ...];  
  ...  
}
```

# LET-BINDING

Factor out common expression:

```
{  
  name = otherAttrSet.a.b.c;  
  src  = otherAttrSet.a.b.d;  
  ...  
}
```

```
let common = otherAttrSet.a.b;  
in  
  {  
    name = common.c;  
    src  = common.d;  
    ...  
  }
```

# FUNCTIONS

## Typescript

```
const f = x => 2x  
f(3)
```

## Nix

```
f = x: 2*x      # definition  
f 3             # usage
```

# FUNCTIONS

## Currying

$g: (\mathbb{R}, \mathbb{R}) \rightarrow \mathbb{R}$   
 $g: (x, y) \mapsto x+y$

$g: \mathbb{R} \rightarrow (\mathbb{R} \rightarrow \mathbb{R})$   
 $g: x \mapsto (y \mapsto x+y)$

## Usage

$g(3, 4)$

$g(3)(4)$

# FUNCTIONS

## Typescript

```
const g = (x,y) => x+y  
g(3,4)
```

## Nix

```
g = x: y: x+y      # definition  
g 3 4              # usage  
((g 3) 4)
```

# FUNCTIONS

```
# Definition
mkDerivation = overrideAttrs: ...

# Usage
mkDerivation {
  name = "myProject-1.0.0";
  src = ./src;
}
```

## Resulting Derivation

```
{
  "/nix/store/dvmidxj5...-myProject-1.0.0.drv": {
    "inputSrcs": [
      "/nix/store/9krlzvn...-default-builder.sh"
    ],
    ...
  }
}
```



# DERIVATION

```
let
  pkgs = ...
in
  pkgs.stdenv.mkDerivation {
    name = "myProject-1.0.0";
    src = ./src;
    buildInputs = [ pkgs.python311 pkgs.poetry ];
    buildPhase = "poetry build";
  }
```




# NIXPKGS

Just a huge attribute set:

```
# pkgs =  
{  
  stdenv = { mkDerivation = .. ; ... }  
  ...  
  poetry = stdenv.mkDerivation {... python311 ...}  
  python39 = ..  
  python311 = ..  
  ...  
  git = ....  
  ...  
  firefox = ...  
  ...  
}
```

<https://github.com/NixOS/nixpkgs>

# SEARCH PACKAGES

 [Back to nixos.org](#) [Packages](#) [Options](#)

Q Search more than **80 000 packages**

**Channel:** [20.03](#) [20.09](#) [unstable](#)

**Package sets**

No package set 28

**Licenses**

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GNU General Public License v2.0 only 10

Unfree 4

No license 1

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**Maintainers**

Takuo Yonezawa 12

Edward Tjörnhammar 8

Tim Steinbach 5

No maintainers 5

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The open-source Java Development Kit  
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<https://search.nixos.org>

# REPRODUCIBLE BUILDS

## Store

```
/nix/store/fdffffkdfj23j45r2102jfd-myProject-1.0.0.drv
/nix/store/9234jfkdj23j45r2102jfd-myProject-1.0.0
/nix/store/34234sdfjskdfj32j4kjdsf-python311-3.11.0
..
/nix/store/fsdkf234jdfdsfjkj0111df-poetry-1.6.1
/nix/store/sdf34dfkjljkj09u123123ss-poetry-1.6.1
..
```

```
$ nix build <derivation>    # build artifact, put into store
```

```
$ nix develop flake.nix    # load environment with buildInputs
```

DEMO

# NIXOS

```
{  
  boot.kernelPackages = pkgs.linuxPackages_6_5;  
  users.users.mneuss = { home = "/home/mneuss"; ...};  
  
  environment.systemPackages = with pkgs; [  
    jetbrains.idea-ultimate  
    python311  
  ];  
  
  services.xserver.desktopManager.gnome3.enable = true;  
  networking.firewall.allowedTCPPorts = [ 80 ];  
  ...  
}
```

```
nixos-rebuild switch ...
```

# FURTHER STUDY



- **Main Page**

<https://nixos.org/>

- **Nix packages**

[https://github.com  
/NixOS/nixpkgs](https://github.com/NixOS/nixpkgs)

- **My Blog**

<https://lambdablob.com>

- **Switch Dev  
Environments**

<https://direnv.net/>