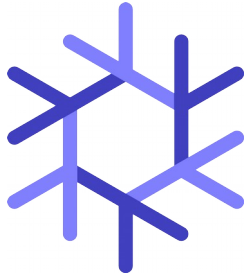


NixOS

The Purely Functional Linux Distribution

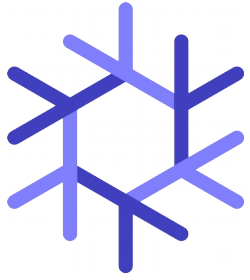
Was ist NixOS?



NixOS

The Purely Functional Linux Distribution

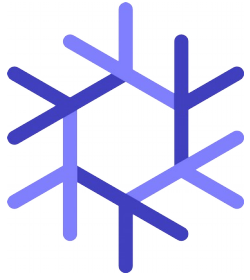
Deklarativ



NixOS

The Purely Functional Linux Distribution

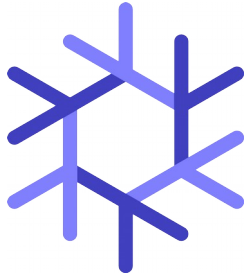
Pure



NixOS

The Purely Functional Linux Distribution

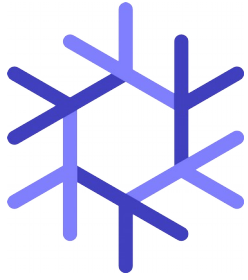
Functional



NixOS

The Purely Functional Linux Distribution

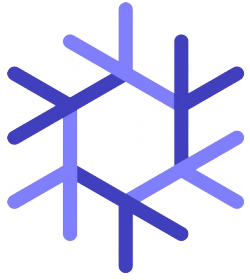
Reliable



NixOS

The Purely Functional Linux Distribution

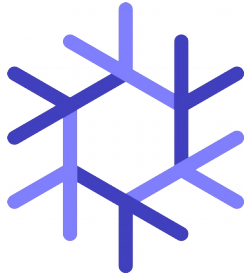
Reproducible



NixOS

The Purely Functional Linux Distribution

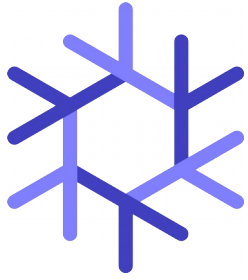
Atomic upgrades



NixOS

The Purely Functional Linux Distribution

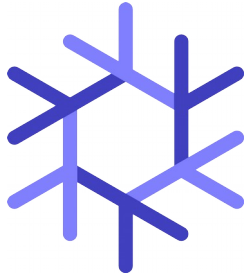
Rollbacks



NixOS

The Purely Functional Linux Distribution

And More



NixOS

System configuration

- Systemconfiguration wird Deklarativ beschrieben

```
/etc/nixos/configuration.nix
```

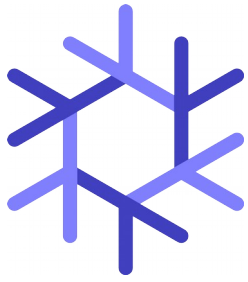
```
{  
  boot.loader.grub.device = "/dev/sda";  
  fileSystems."/".device = "/dev/sda1";  
  services.sshd.enable = true;  
}
```

```
nixos-rebuild switch
```

- Reproduzierbarkeit des Systems
- Testbarkeit

```
nixos-rebuild test
```

```
nixos-rebuild build-vm & ./result/bin/run-*-vm
```



NixOS

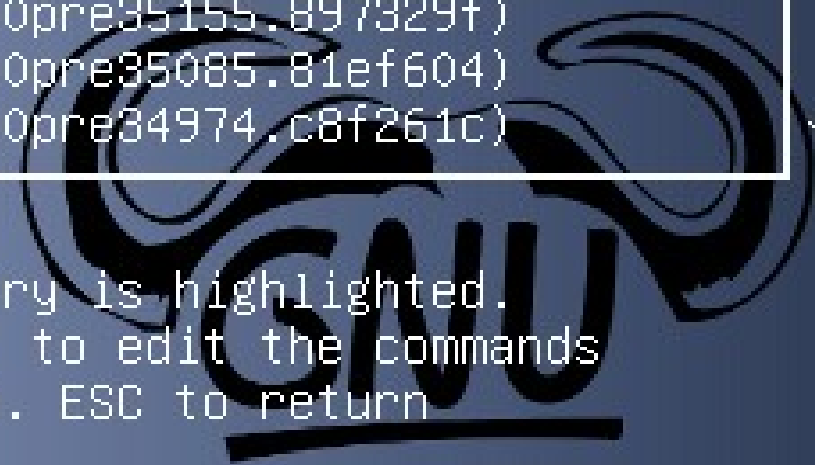
upgrades

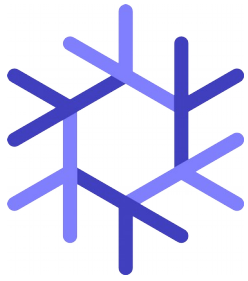
- **Reproducible**
selbe configuration ↔ selbes System
- **Reliable**
System wie neu installation
- **Atomic**
`nixos-rebuild switch`
- **Rollbacks**
`nixos-rebuild switch --rollback`

GNU GRUB version 2.00

```
NixOS - Configuration 312 (2013-11-20 - 13.10.35455.45219b9)
NixOS - Configuration 311 (2013-11-20 - 13.10.35455.45219b9)
NixOS - Configuration 310 (2013-11-19 - 13.10.35450.912f584)
NixOS - Configuration 309 (2013-11-19 - 13.10.35450.912f584)
NixOS - Configuration 308 (2013-11-19 - 13.10.35450.912f584)
NixOS - Configuration 307 (2013-11-08 - 13.10.35442.b77a2cd)
NixOS - Configuration 306 (2013-11-02 - 13.10.35432.a6cc1e4)
NixOS - Configuration 305 (2013-11-01 - 13.10.35427.6fda96b)
NixOS - Configuration 304 (2013-10-31 - 13.10pre35379.70a2c54)
NixOS - Configuration 303 (2013-10-30 - 13.10pre35354.8150f1a)
NixOS - Configuration 302 (2013-10-25 - 13.10pre35223.ab94ccf)
NixOS - Configuration 301 (2013-10-25 - 13.10pre35209.6f911ed)
NixOS - Configuration 300 (2013-10-23 - 13.10pre35155.897329f)
NixOS - Configuration 299 (2013-10-23 - 13.10pre35155.897329f)
NixOS - Configuration 298 (2013-10-21 - 13.10pre35085.81ef604)
NixOS - Configuration 297 (2013-10-16 - 13.10pre34974.c8f261c)
```

Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, `e' to edit the commands
before booting or `c' for a command-line. ESC to return

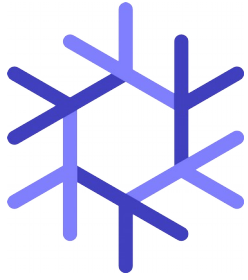




NixOS

upgrades

- Reliable
- Reproducible
- Atomic
 - `nixos-rebuild switch`
- Rollbacks
 - `nixos-rebuild switch --rollback`
- Multi-user package management
- Mehrere Varianten gleicher Software

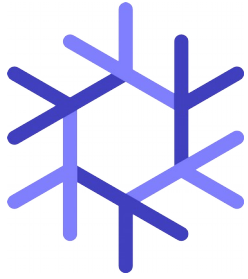


NixOS

The Purely Functional Linux Distribution

Start der Live Demonstration

Folien wurden Nachträglich mit Screenshots
ergänzt



NixOS

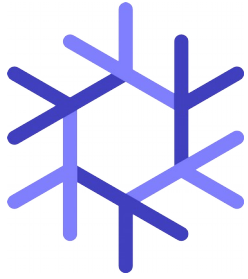
The Purely Demonstration

Auf der Suche nach den Programmen:

```
File Edit View Bookmarks Settings Help
[root@nixos:/bin]# which firefox
/run/current-system/sw/bin/firefox

[root@nixos:/bin]# cd /run/current-system/sw/bin

[root@nixos:/run/current-system/sw/bin]# ls
[
[[
a2p
accountwizard
aconnect
acpid
adddebug
addgnupghome
addgroup
addpart
Me : bash
```



NixOS

The Purely Demonstration

Es Fehlt: /lib, /sbin, /usr

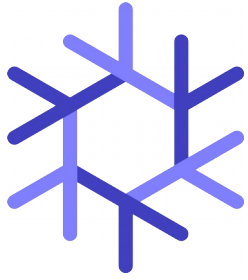
```
File Edit View Bookmarks Settings Help

[root@nixos:~]# cd /

[root@nixos:~]# ls
bin      etc      nix      run      usr
boot    home    proc     sys      var
dev     media   root     tmp

[root@nixos:~]#
```

Me : bash



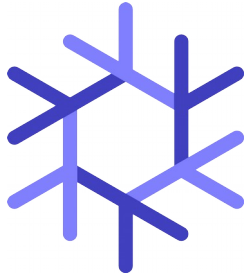
NixOS

The Purely Demonstration

/bin ist ebenfalls leer
Wo sind all die Programme?

```
File Edit View Bookmarks Settings Help
[root@nixos:~/]# cd bin/
[root@nixos:~/bin]# ls
sh
[root@nixos:~/bin]#
```

Me : bash



NixOS

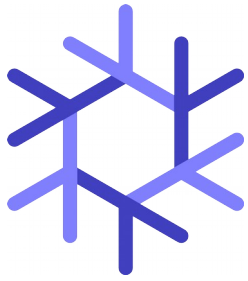
The Purely Demonstration

Auf der Suche nach den Programmen:

```
File Edit View Bookmarks Settings Help
[root@nixos:/bin]# which firefox
/run/current-system/sw/bin/firefox

[root@nixos:/bin]# cd /run/current-system/sw/bin

[root@nixos:/run/current-system/sw/bin]# ls
[
[[
a2p
accountwizard
aconnect
acpid
adddebug
addgnupghome
addgroup
addpart
Me : bash
```

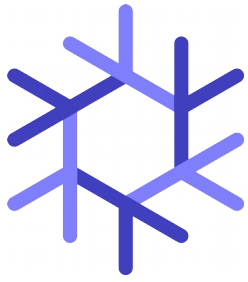


NixOS

The Purely Demonstration

Auf der Suche nach den Programmen:

```
File Edit View Bookmarks Settings Help
[root@nixos:/run/current-system/sw/bin]# ls -alh
total 6.8M
dr-xr-xr-x 1 root nixbld 31K Jan  1 1970 .
dr-xr-xr-x 1 root nixbld  36 Jan  1 1970 ..
lrwxrwxrwx 1 root nixbld  64 Jan  1 1970 [ -> /nix/store/bnlcsbw7nhd21vw4xssnxi9y7h2asjj-coreutils-8.23/bin/[
lrwxrwxrwx 1 root nixbld  65 Jan  1 1970 [[ -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/[[
lrwxrwxrwx 1 root nixbld  63 Jan  1 1970 a2p -> /nix/store/5jnf7xgz0prz618l3nayibi51j9ym-perl-5.20.2/bin/a2p
lrwxrwxrwx 1 root nixbld  83 Jan  1 1970 accountwizard -> /nix/store/4rh1lqraz21slx063cnfzffdc49pv87f-kdepim-runtime-4.14.3/b
in/accountwizard
lrwxrwxrwx 1 root nixbld  74 Jan  1 1970 aconnect -> /nix/store/rgqrd08q6sn1skxppxgvmr2mnpmf9hw-alsa-utils-1.0.29/bin/aconne
ct
lrwxrwxrwx 1 root nixbld  68 Jan  1 1970 acpid -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/acpid
lrwxrwxrwx 1 root nixbld  79 Jan  1 1970 adddebug -> /nix/store/d207wfszk6rcjdxyh2fpzd0sd8v3582a-kde-dev-scripts-4.14.3/bin/a
dddebug
lrwxrwxrwx 1 root nixbld  73 Jan  1 1970 addgnupghome -> /nix/store/9knqbd4bhg841y5q5xg76dc8ybp6kv7f-gnupg-2.0.27/bin/addgnup
ghome
lrwxrwxrwx 1 root nixbld  71 Jan  1 1970 addgroup -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/addgroup
lrwxrwxrwx 1 root nixbld  73 Jan  1 1970 addpart -> /nix/store/hbfqrx5qfgqmpg0j393k39z3c6807dj-util-linux-2.26.2/bin/addpart
lrwxrwxrwx 1 root nixbld  73 Jan  1 1970 addr2line -> /nix/store/yxg5zsxjpl1l6xk7r23rayyc18fkxynk-binutils-2.23.1/bin/addr2li
ne
lrwxrwxrwx 1 root nixbld  72 Jan  1 1970 add-shell -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/add-shel
l
lrwxrwxrwx 1 root nixbld  70 Jan  1 1970 adduser -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/adduser
lrwxrwxrwx 1 root nixbld  71 Jan  1 1970 adjtimex -> /nix/store/2ln22qns3l6flfkzy7axisv3yisia256-busybox-1.23.2/bin/adjtimex
lrwxrwxrwx 1 root nixbld  72 Jan  1 1970 agetty -> /nix/store/hbfqrx5qfgqmpg0j393k39z3c6807dj-util-linux-2.26.2/bin/agetty
lrwxrwxrwx 1 root nixbld  77 Jan  1 1970 akonadi2xml -> /nix/store/d8swhzvydaxmnasj0l7v0q2g7zp8l50w-kdepimlibs-4.14.3/bin/ako
nadi2xml
lrwxrwxrwx 1 root nixbld  85 Jan  1 1970 akonadi_agent_launcher -> /nix/store/a7571kcykhsrsfsmqy29jxn4n6xk5rw1-akonadi-1.13.0
/bin/akonadi_agent_launcher
lrwxrwxrwx 1 root nixbld  83 Jan  1 1970 akonadi_agent_server -> /nix/store/a7571kcykhsrsfsmqy29jxn4n6xk5rw1-akonadi-1.13.0/b
in/akonadi_agent_server
lrwxrwxrwx 1 root nixbld  87 Jan  1 1970 akonadi_archivemail_agent -> /nix/store/qyisvvgxjmyad210jcmg8r7fwzpw188-kdepim-4.14
.3/bin/akonadi_archivemail_agent
lrwxrwxrwx 1 root nixbld  85 Jan  1 1970 akonadi_benchmark -> /nix/store/d8swhzvydaxmnasj0l7v0q2g7zp8l50w-kdepimlibs-4.14.3
/bin/akonadi_benchmark
lrwxrwxrwx 1 root nixbld  96 Jan  1 1970 akonadi_birthdays_resource -> /nix/store/4rh1lqraz21slx063cnfzffdc49pv87f-kdepim-run
```

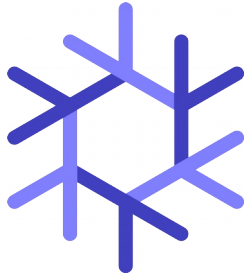


NixOS

/nix/store

- Programme werden in unter /nix/store installiert
- Individuelle Hashes verhindern Kollisionen

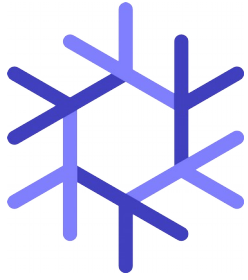
```
store hash (exampleprogram) =  
  hash (alle Abhängigkeiten) &  
  hash (exampleprogram.nix) &  
  hash (exampleprogram-1.2.3.tgz)
```



NixOS

Paketierung

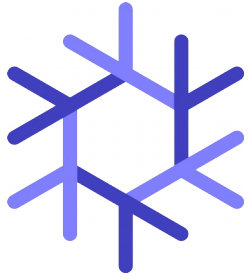
- alle software in NixOS ist eingekapselt
- c/c++ Programme mit RPATH
- python Scripte mit vorgeschaltetem wrapper
- ähnliches ist dies mit andere Scriptsprachen
- es existiert nur /bin/sh
- kein #!/bin/bash
- kein #!/usr/bin/python



NixOS

Anwendungsfälle – Entwicklungsumgebung

- Isolierte Benutzerumgebung
- Userumgebung bleibt unbeeinträchtigt
`nix-shell -p cmake`
- Oder dauerhaft per `default.nix`



NixOS

Anwendungsfälle – Virtualisierung

- Virtuelle Maschinen deklarativ beschreiben
- shared store
- Sehr schnelles Erstellen
- Deployment über NixOps
 - Funktioniert auch mit:
 - Kontainern
 - Hetzner root Servern
 - Amazon Services (EC2, S3 buckets, ect...)

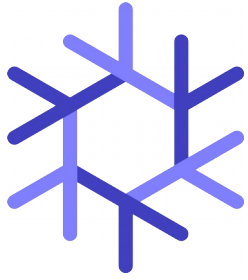
network.nix

```
{
  webservers =
    { deployment.targetEnv = "virtualbox";
      services.httpd.enable = true;
      services.httpd.documentRoot = "/data";
      fileSystems."/data" =
        { fsType = "nfs4";
          device = "fileserver:/"; };
    };

  fileserver =
    { deployment.targetEnv = "virtualbox";
      services.nfs.server.enable = true;
      services.nfs.server.exports = "...";
    };
}
```

nixops create -d simple network.nix

nixops deploy -d simple

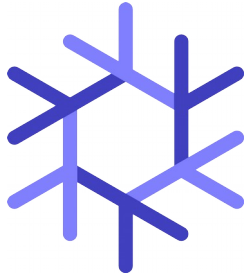


NixOS

Anwendungsfälle – Container

- shared store
- deklarativ beschreibbar

```
containers.database =
  { config =
    { config, pkgs, ... }:
    { services.postgresql.enable = true;
      services.postgresql.package =
        pkgs.postgresql92;
    };
  };
};
```



NixOS

Anwendungsfälle – Container

Startet den Kontainer:

```
nixos-container start database
```

Statusabfrage:

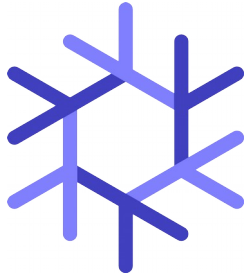
```
nixos-container status database
```

Login als Root:

```
nixos-container root-login database
```

Stopt den Kontainer

```
nixos-container stop database
```



NixOS

The Purely Functional Linux Distribution

Fragen ?