Package Management

Software installatie

Algemeen

- Software wordt aangeboden in pakketvorm
  - package = bestand met extensie .deb / .rpm
  - package bevat eigenlijke software en metadata
    - metadata: naam, versienr, ... dependencies

- Dependencies
  - welke packages zijn nodig opdat het package zou werken

- Software Repository
  - lijst met beschikbare software voor een bepaalde distributie
  - locatie waar software packages afgehaald kunnen worden
  - meestal url, ook cdrom

packages

- debian/ubuntu: .deb
  - dpkg: Debian PacKaGe management
    - installatie van .deb bestanden
    - beheer van geïnstalleerde packages
  - apt: Advanced Packaging Tool
    - front-end tool voor dpkg
    - bij installatie: downloadt .deb-bestanden van repository en roept dpkg aan
    - beheer van geïnstalleerde packages
  - GUI front-end (voor apt)
    - Ubuntu Software Center
    - Synaptic

RedHat: .rpm
  - rpm, yum, …

dpkg: informatie opzoeken

- ## dpkg -l $package
  - ### korte informatie van een individueel package

```
student@server2:~$ dpkg -l *ssh*
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name                 Version         Architecture    Description
+++-====================-===============-===============-================================
un  libpam-ssh           <none>          <none>          (no description available)
ii  openssh-client       1:6.6p1-2ubunt  amd64           secure shell (SSH) client, for secure acces
un  openssh-server       <none>          <none>          (no description available)
un  ssh                  <none>          <none>          (no description available)
un  ssh-askpass          <none>          <none>
un  ssh-client           <none>          <none>
un  ssh-krb5             <none>          <none>
student@server2:~$ dpkg -l vim
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name                 Version         Architecture    Description
+++-====================-===============-===============-================================
ii  vim                  2:7.4.052-1ubu  amd64           Vi IMproved - enhanced vi editor
```

ii: geïnstalleerd en geconfigureerd
(meerdere toestanden mogelijk, zie man dpkg)
Architecture: all, amd64, i386

dpkg: informatie opzoeken

- dpkg -l
  - lijst van alle **geïnstalleerde** packages (wordt gehaald uit /var/lib/dpkg/status)

```
student@server2:~$ dpkg -l | head -7
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
|/ Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
||/ Name                          Version                    Architecture Description
+++-=============================-==========================-============-==================
================================================================
ii  accountsservice               0.6.35-0ubuntu7            amd64        query and manipul
ate user account information
ii  acpid                         1:2.0.21-1ubuntu2          amd64        Advanced Configur
ation and Power Interface event daemon
student@server2:~$ dpkg -l | wc -l
432
```

Ubuntu Desktop:
```
student@UbuntuDesktop:~$ dpkg -l | wc -l
1714
```

dpkg: informatie opzoeken

- dpkg -p $package
    - toon details van een individueel package (zoekt in bestand /var/lib/dpkg/available)

```
student@server2:~$ dpkg -p bash
Package: bash
Essential: yes
Priority: required
Section: shells
Installed-Size: 1588
Origin: Ubuntu
Maintainer: Ubuntu Developers <ubuntu-devel-discuss@lists.ubuntu.com>
Bugs: https://bugs.launchpad.net/ubuntu/+filebug
Architecture: amd64
Multi-Arch: foreign
Version: 4.4.18-2ubuntu1
Replaces: bash-completion (<< 20060301-0), bash-doc (<= 2.05-1)
Depends: base-files (>= 2.1.12), debianutils (>= 2.15)
Pre-Depends: libc6 (>= 2.15), libtinfo5 (>= 6)
Recommends: bash-completion (>= 20060301-0)
Suggests: bash-doc
Conflicts: bash-completion (<< 20060301-0)
Filename: pool/main/b/bash/bash_4.4.18-2ubuntu1_amd64.deb
```

dpkg: informatie opzoeken

- ## dpkg -S
  - zoek welk package een bepaalde file heeft geïnstalleerd

  ```
  student@server2:~$ dpkg -S /etc/ssh/ssh_config /sbin/ifconfig
  openssh-client: /etc/ssh/ssh_config
  net-tools: /sbin/ifconfig
  ```

- ## dpkg -L
  - toon de bestanden die geïnstalleerd zijn door een bepaald programma

  ```
  student@server2:~$ dpkg -L vim
  /.
  /usr
  /usr/bin
  /usr/bin/vim.basic
  /usr/share
  /usr/share/lintian
  /usr/share/lintian/overrides
  /usr/share/lintian/overrides/vim
  /usr/share/bug
  /usr/share/bug/vim
  /usr/share/bug/vim/presubj
  /usr/share/bug/vim/script
  /usr/share/doc
  /usr/share/doc/vim
  ```

dpkg: installatie

- .deb file downloaden (via browser, wget)

```
student@server2:~$ wget -q http://ftp.de.debian.org/debian/pool/main/c/cowsay/cowsay_3.03+dfsg1-4_all.deb
student@server2:~$ ls
cowsay_3.03+dfsg1-4_all.deb
```

- installatie
  - dpkg -i

```
student@server2:~$ sudo dpkg -i cowsay_3.03+dfsg1-4_all.deb
Selecting previously unselected package cowsay.
(Reading database ... 53042 files and directories currently installed.)
Preparing to unpack cowsay_3.03+dfsg1-4_all.deb ...
Unpacking cowsay (3.03+dfsg1-4) ...
Setting up cowsay (3.03+dfsg1-4) ...
Processing triggers for man-db (2.6.7.1-1) ...
student@server2:~$ rm cowsay_3.03+dfsg1-4_all.deb
student@server2:~$ cowsay ok
 ____
< ok >
 ----
        \   ^__^
         \  (oo)_____
            (__)\       )\/\
                ||----w |
                ||     ||
```

.deb mag na installatie verwijderd worden
Nadeel: dependencies worden niet gegarandeerd door dpkg

dpkg: packages verwijderen

- ## dpkg -r
  - verwijder een package

  ```
  student@server2:~$ sudo dpkg -r cowsay
  (Reading database ... 53107 files and directories currently installed.)
  Removing cowsay (3.03+dfsg1-4) ...
  Processing triggers for man-db (2.6.7.1-1) ...
  ```

- ## dpkg -P
  - purge: ook alle configuratie bestanden worden verwijderd

  ```
  student@server2:~$ sudo dpkg -P cowsay
  (Reading database ... 53107 files and directories currently installed.)
  Removing cowsay (3.03+dfsg1-4) ...
  Processing triggers for man-db (2.6.7.1-1) ...
  ```

  enkel indien package is geïnstalleerd
  kan het verwijderd worden

apt: help

- apt help
  - toont een beknopte help
  - meer info via de manpages

```
student@server2:~$ apt help
apt 1.6.3ubuntu0.1 (amd64)
Usage: apt [options] command

apt is a commandline package manager and provides commands for
searching and managing as well as querying information about packages.
It provides the same functionality as the specialized APT tools,
like apt-get and apt-cache, but enables options more suitable for
interactive use by default.

Most used commands:
  list - list packages based on package names
  search - search in package descriptions
  show - show package details
  install - install packages
  remove - remove packages
  autoremove - Remove automatically all unused packages
  update - update list of available packages
  upgrade - upgrade the system by installing/upgrading packages
  full-upgrade - upgrade the system by removing/installing/upgrading packages
  edit-sources - edit the source information file

See apt(8) for more information about the available commands.
Configuration options and syntax is detailed in apt.conf(5).
Information about how to configure sources can be found in sources.list(5).
Package and version choices can be expressed via apt_preferences(5).
Security details are available in apt-secure(8).
                            This APT has Super Cow Powers.
student@server2:~$
```

apt: installatie

- ## apt update

  - bekijkt de repositories geconfigureerd in `/etc/apt/sources.list`

  - van elke repository wordt de package metadata afgehaald en in de APT cache geplaatst (`/var/lib/apt/lists/...`)

  > apt update
  >   → wordt aangeraden voor iedere belangrijke installatie of upgrade
  >   → moet ook uitgevoerd worden na iedere wijziging in `/etc/apt/sources.list`

apt: installatie

```
student@server2:~$ cat /etc/apt/sources.list
deb http://archive.ubuntu.com/ubuntu bionic main
deb http://archive.ubuntu.com/ubuntu bionic-security main
deb http://archive.ubuntu.com/ubuntu bionic-updates main
```

1. deb: binaries
   deb-src: source code
2. locatie (meestal url: eventueel ook cdrom)
3. code naam distributie
4. main, restricted, universe, multiverse

```
student@ubuntudesktop01:~$ cat /etc/apt/sources.list
#deb cdrom:[Ubuntu 18.04.1 LTS _Bionic Beaver_ - Release a

# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrade to
# newer versions of the distribution.
deb http://be.archive.ubuntu.com/ubuntu/ bionic main restricted
# deb-src http://be.archive.ubuntu.com/

## Major bug fix updates produced after
## distribution.
deb http://be.archive.ubuntu.com/ubuntu
# deb-src http://be.archive.ubuntu.com/

## N.B. software from this repository i
## team. Also, please note that softwar
## review or updates from the Ubuntu security team.
deb http://be.archive.ubuntu.com/ubuntu/ bionic universe
# deb-src http://be.archive.ubuntu.com/ubuntu/ bionic universe
deb http://be.archive.ubuntu.com/ubuntu/ bionic-updates universe
```

The repository components are:

Main – Officially Supported, Open-Source Software
Restricted – Officially Supported, Closed-Source Software
Universe – Community-Maintained, Open-Source Software
Multiverse – Unsupported, Closed-Source and Patent-Encumbered Software

apt install

- apt install

  - zoekt naar packagenaam in de APT-cache   (`/var/lib/apt/lists/…`)

  - indien gevonden: downloadt .deb bestanden naar
    `/var/cache/apt/archives`   (indien nodig)
    downloadt ook alle packages nodig om de dependencies te vervullen

 - roept dpkg aan om .deb-bestanden te installeren

apt install

```
student@ubuntudesktop01:~$ sudo apt install sl
[sudo] password for student:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  sl
0 upgraded, 1 newly installed, 0 to remove and 211 not upgraded.
Need to get 26,4 kB of archives.
After this operation, 98,3 kB of additional disk space will be used.
Get:1 http://be.archive.ubuntu.com/ubuntu bionic/universe amd64 sl amd64 3.03-17build2 [26,4 kB]
Fetched 26,4 kB in 0s (140 kB/s)
Selecting previously unselected package sl.
(Reading database ... 166220 files and directories currently installed.)
Preparing to unpack .../sl_3.03-17build2_amd64.deb ...
Unpacking sl (3.03-17build2) ...
Setting up sl (3.03-17build2) ...
Processing triggers for man-db (2.8.3-2) ...
student@ubuntudesktop01:~$
```

```
student@ubuntudesktop01:~$ sl
```
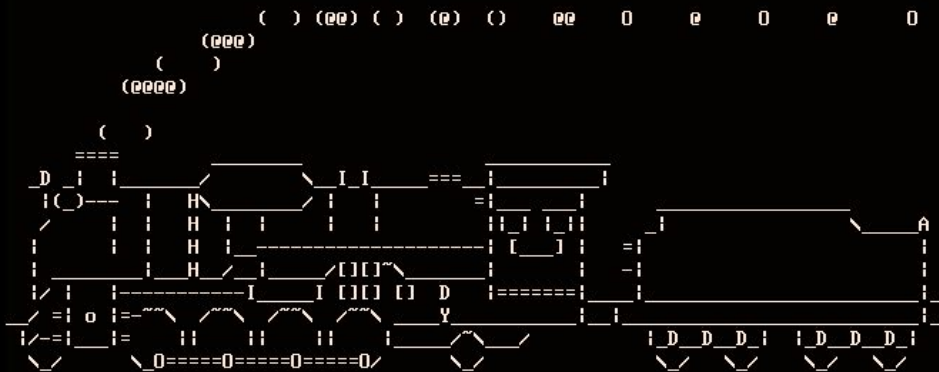
apt clean

- apt clean
  - maakt `/var/cache/apt/archives` leeg

```
student@ubdesk:~$ ls /var/cache/apt/archives/
apparmor_2.10.95-0ubuntu2.7_amd64.deb
apport_2.20.1-0ubuntu2.13_all.deb
apport-gtk_2.20.1-0ubuntu2.13_all.deb
bind9-host_1%3a9.10.3.dfsg.P4-8ubuntu1.9_amd64.deb
binutils_2.26.1-1ubuntu1~16.04.5_amd64.deb
bluez_5.37-0ubuntu5.1_amd64.deb
bluez-cups_5.37-0ubuntu5.1_amd64.deb
bluez-obexd_5.37-0ubuntu5.1_amd64.deb
ca-certificates_20170717~16.04.1_all.deb
chromium-codecs-ffmpeg-extra_62.0.3202.94-0ubuntu0.16.04.1317_amd64.deb
compizconfig-settings-manager_1%3a0.9.12.2+16.04.20160823-0ubuntu1_all.deb
cpp-5_5.4.0-6ubuntu1~16.04.5_amd64.deb
cracklib-runtime_2.9.2-1ubuntu1_amd64.deb
cryptsetup_2%3a1.6.6-5ubuntu2.1_amd64.deb
cryptsetup-bin_2%3a1.6.6-5ubuntu2.1_amd64.deb
cups_2.1.3-4ubuntu0.3_amd64.deb
cups-bsd_2.1.3-4ubuntu0.3_amd64.deb
cups-client_2.1.3-4ubuntu0.3_amd64.deb
cups-common_2.1.3-4ubuntu0.3_all.deb
cups-core-drivers_2.1.3-4ubuntu0.3_amd64.deb
cups-daemon_2.1.3-4ubuntu0.3_amd64.deb
cups-ppdc_2.1.3-4ubuntu0.3_amd64.deb
```

```
student@ubdesk:~$ sudo apt clean
[sudo] password for student:
student@ubdesk:~$ ls /var/cache/apt/archives/
lock    partial
student@ubdesk:~$
```

apt remove

- apt remove

  - verwijder een package

  ```
  student@ubuntudesktop01:~$ sudo apt remove sl
  Reading package lists... Done
  Building dependency tree
  Reading state information... Done
  The following packages will be REMOVED:
    sl
  0 upgraded, 0 newly installed, 1 to remove and 211 not upgraded.
  After this operation, 98,3 kB disk space will be freed.
  Do you want to continue? [Y/n]
  (Reading database ... 166250 files and directories currently installed.)
  Removing sl (3.03-17build2) ...
  Processing triggers for man-db (2.8.3-2) ...
  student@ubuntudesktop01:~$
  ```

- apt purge

  - verwijder inclusief configuratiebestanden

apt autoremove

- apt autoremove → Slide 1/3
  - verwijdert dependencies die niet meer nodig zijn voor de nog geïnstalleerde packages

```
student@ubdesk1804:~$ dpkg -l | grep shotwell
student@ubdesk1804:~$ sudo apt install shotwell
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  shotwell-common
The following NEW packages will be installed:
  shotwell shotwell-common
0 upgraded, 2 newly installed, 0 to remove and 157 not upgraded.
```

```
student@ubdesk1804:~$ dpkg -l | grep shotwell
ii  shotwell                    0.28.4-0ubuntu1
ii  shotwell-common             0.28.4-0ubuntu1
```

apt autoremove

- apt autoremove → Slide 2/3
  - verwijdert dependencies die niet meer nodig zijn voor de nog geïnstalleerde packages

```
student@ubdesk1804:~$ sudo apt purge shotwell
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  shotwell-common
Use 'sudo apt autoremove' to remove it.
The following packages will be REMOVED:
  shotwell*
0 upgraded, 0 newly installed, 1 to remove and 157 not upgraded.
After this operation, 6.388 kB disk space will be freed.
Do you want to continue? [Y/n] y
(Reading database ... 167020 files and directories currently installed.)
Removing shotwell (0.28.4-0ubuntu1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
Processing triggers for desktop-file-utils (0.23-1ubuntu3.18.04.1) ...
Processing triggers for libc-bin (2.27-3ubuntu1) ...
Processing triggers for man-db (2.8.3-2) ...
Processing triggers for gnome-menus (3.13.3.11ubuntu1.1)
student@ubdesk1804:~$ dpkg -l | grep shotwell
ii  shotwell-common                              0.28.4-0ubuntu1                     all           digi
student@ubdesk1804:~$
```

apt autoremove

- apt autoremove   → Slide 3/3
  - verwijdert dependencies die niet meer nodig zijn voor de nog geïnstalleerde packages

```
student@ubdesk1804:~$ sudo apt autoremove
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages will be REMOVED:
  shotwell-common
0 upgraded, 0 newly installed, 1 to remove and 157 not upgraded.
After this operation, 807 kB disk space will be freed.
Do you want to continue? [Y/n]
(Reading database ... 166989 files and directories currently installed.)
Removing shotwell-common (0.28.4-0ubuntu1) ...
Processing triggers for libglib2.0-0:amd64 (2.56.2-0ubuntu0.18.04.2) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
student@ubdesk1804:~$ dpkg -l | grep shotwell
student@ubdesk1804:~$
```

apt upgrade

- apt upgrade
  - een update
    voor alle software
    die op dit moment
    is geïnstalleerd

```
student@server2:~$ sudo apt update
Hit:1 http://archive.ubuntu.com/ubuntu bionic InRelease
Get:2 http://archive.ubuntu.com/ubuntu bionic-security InRelease [83.2 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic-updates InRelease [88.7 kB]
Fetched 172 kB in 1s (338 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
97 packages can be upgraded. Run 'apt list --upgradable' to see them.
student@server2:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following NEW packages will be installed:
  libuv1 python3-netifaces
The following packages will be upgraded:
  amd64-microcode apport apt apt-utils base-files bind9-host bsdutils cloud-init cloud-initramfs-copymods
  cloud-initramfs-dyn-netconf console-setup console-setup-linux cryptsetup cryptsetup-bin dnsutils dpkg
  fdisk friendly-recovery gcc-8-base grub-common grub-pc grub-pc-bin grub2-common initramfs-tools
  initramfs-tools-bin initramfs-tools-core keyboard-configuration kmod libapt-inst2.0 libapt-pkg5.0
  libbind9-160 libblkid1 libcryptsetup12 libdns-export1100 libdns1100 libfdisk1 libgcc1 libglib2.0-0
  libglib2.0-data libirs160 libisc-export169 libisc169 libisccc160 libisccfg160 libkmod2 libldap-2.4-2
  libldap-common liblwres160 liblxc-common liblxc1 libmount1 libparted2 libplymouth4 libpython3-stdlib
  libpython3.6 libpython3.6-minimal libpython3.6-stdlib libsmartcols1 libstdc++6 libuuid1 linux-firmware
  lshw lxcfs lxd lxd-client man-db mount netplan.io networkd-dispatcher nplan open-iscsi open-vm-tools
  overlayroot parted plymouth plymouth-theme-ubuntu-text python-apt-common python3 python3-apport
  python3-apt python3-distupgrade python3-gdbm python3-minimal python3-problem-report
  python3-software-properties python3-update-manager python3.6 python3.6-minimal
  software-properties-common sosreport ubuntu-keyring ubuntu-release-upgrader-core unattended-upgrades
  update-manager-core update-notifier-common util-linux uuid-runtime
97 upgraded, 2 newly installed, 0 to remove and 0 not upgraded.
Need to get 97.8 MB of archives.
After this operation, 867 kB of additional disk space will be used.
Do you want to continue? [Y/n]
Get:1 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 base-files amd64 10.1ubuntu2.3 [60.4 kB]
```

apt list

- apt list
  - toont alle packages die geïnstalleerd kunnen worden

```
student@ubserv:~$ apt list | head

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

Listing...
0ad/xenial 0.0.20-1 amd64
0ad-data/xenial,xenial 0.0.20-1 all
0ad-data-common/xenial,xenial 0.0.20-1 all
0ad-dbg/xenial 0.0.20-1 amd64
0install/xenial 2.10-2 amd64
0install-core/xenial 2.10-2 amd64
0xffff/xenial 0.6.1-3 amd64
2048-qt/xenial 0.1.6-1 amd64
2ping/xenial,xenial 3.2.1-1 all
student@ubserv:~$
```

apt search

- apt search
  - doorzoek de APT-cache (geen netwerk verbinding nodig)

```
student@ubuntudesktop01:~$ apt search cowsay
Sorting... Done
Full Text Search... Done
cowsay/bionic,bionic 3.03+dfsg2-4 all
  configurable talking cow

cowsay-off/bionic,bionic 3.03+dfsg2-4 all
  configurable talking cow (offensive cows)

presentty/bionic 0.2.0-1 amd64
  Console-based presentation software

xcowsay/bionic 1.4-1 amd64
  Graphical configurable talking cow

student@ubuntudesktop01:~$
```

apt show

- apt show
  - Informatie tonen van een bepaald package

```
student@ubserv:~$ apt show htop
Package: htop
Version: 2.0.1-1ubuntu1
Priority: optional
Section: universe/utils
Origin: Ubuntu
Maintainer: Ubuntu Developers <ubuntu-devel-discuss@lists.ubuntu.com>
Original-Maintainer: Daniel Lange <dl.ml1@usrlocal.de>
Bugs: https://bugs.launchpad.net/ubuntu/+filebug
Installed-Size: 215 kB
Depends: libc6 (>= 2.15), libncursesw5 (>= 6), libtinfo5 (>= 6)
Suggests: lsof, strace
Homepage: http://hisham.hm/htop/
Download-Size: 76.4 kB
APT-Sources: http://be.archive.ubuntu.com/ubuntu xenial-updates/universe amd64 Packages
Description: interactive processes viewer
 Htop is an ncursed-based process viewer similar to top, but it
 allows one to scroll the list vertically and horizontally to see
 all processes and their full command lines.
 .
 Tasks related to processes (killing, renicing) can be done without
 entering their PIDs.

N: There is 1 additional record. Please use the '-a' switch to see it
student@ubserv:~$
```

apt edit-sources

- apt edit-sources
  - shortcut om de file '/etc/apt/sources.list' te editeren

```
student@ubdesk:~$ sudo apt edit-sources
[sudo] password for student:

Select an editor.  To change later, run 'select-editor'.
  1. /bin/ed
  2. /bin/nano          <---- easiest
  3. /usr/bin/vim.basic
  4. /usr/bin/vim.tiny

Choose 1-4 [2]: 3
```

```
# deb cdrom:[Ubuntu 18.04.1 LTS _Bionic Beaver_ - Release amd64 (2018
nic main restricted

# See http://help.ubuntu.com/community/UpgradeNotes for how to upgrad
# newer versions of the distribution.
deb http://be.archive.ubuntu.com/ubuntu/ bionic main restricted
# deb-src http://be.archive.ubuntu.com/ubuntu/ bionic main restricted

## Major bug fix updates produced after the final release of the
## distribution.
deb http://be.archive.ubuntu.com/ubuntu/ bionic-updates main restrict
```

Installatie software: extra

- personal package archives (ppa)
- tar
- make

PPA

- PPA
  - Personal Package Archives
  - repositories voor packages die niet standaard in Ubuntu zitten
    - Dus niet in een standaard repositories van `/etc/apt/sources.list`
  - kunnen gezocht worden via website "https://launchpad.net/ubuntu/+ppas"
  - Eerst dienen we Ubuntu naar de PPA te laten wijzen
    - zodanig dat deze mee bekeken wordt bij
      sudo apt update
  - Daarna kunnen we de packages uit deze PPA installeren
    - met sudo apt install

PPA

- Toevoegen van een PPA
  - sudo apt-add-repository ppa:<ppa package>
- Verwijderen van een PPA
  - sudo apt-add-repository **-r** ppa:<ppa package>
- Opnemen van repository-wijzigingen in APT-cache
  - sudo apt update
- Zoeken van de package
  - apt search <package>
- Installeren van de package
  - sudo apt install <package>

apt-add-repository   is hetzelfde als het commando
add-apt-repository

tar (tape archiver)

- bewaar / extraheer een directorystructuur (inclusief ownerships en permissions) in één bestand, genaamd tar-archive = bestand met extensie .tar

- tar-archive wordt dikwijls gecomprimeerd met gzip, dit noemt met dan een tarball tarball = bestand met extensie tar.gz

- software kan je soms als tarball afhalen en installeren met behulp van het tar-commando

tar: een tar-archiefbestand maken

- Voorbeeld:
  - maak een back-up van de directory '/home' en zet deze in een bestand home.tar in de /tmp-directory

  ```
  student@server2:~$ sudo tar -cf /tmp/home.tar /home
  tar: Removing leading `/' from member names
  student@server2:~$ ls /tmp/
  home.tar
  ```

  - Opties
    - c: maak een archief (Create)
    - x: pak een archief uit (eXtract)
    - f: schrijf weg naar een file niet naar STDOUT

    - P: de eerste slash behouden (voor absolute padnamen)

tar: een tar-archiefbestand maken

- Voorbeeld:
  - Er kunnen ook meerdere sources opgegeven worden:

```
student@server2:~$ sudo tar -cf /tmp/system-bu.tar /home /srv /var /root
tar: Removing leading '/' from member names
student@server2:~$ ls /tmp/
home.tar   system-bu.tar
```

tar: compressie

- Automatisch comprimeren:
  - -z: comprimeer met gzip, standaard naamgeving is *.tar.gz
  - Voorbeeld:

  ```
  student@server2:~$ sudo tar -czf /tmp/home.tar.gz /home
  tar: Removing leading `/' from member names
  student@server2:~$ ls /tmp/
  home.tar   home.tar.gz   system-bu.tar
  ```

  - -j: comprimeer met bzip2, standaard naamgeving is *.tbz2
  - Voorbeeld:

  ```
  student@server2:~$ sudo tar -cjf /tmp/home.tbz2 /home
  tar: Removing leading `/' from member names
  student@server2:~$ ls /tmp/
  home.tar   home.tar.gz   home.tbz2   system-bu.tar
  ```

tar: absolute of relatieve paden

- relatief pad:

```
student@ubuntudesktop01:~$ tar -cf /tmp/mydocuments.tar /home/student/Documents/
tar: Removing leading `/' from member names
student@ubuntudesktop01:~$ tar -tf /tmp/mydocuments.tar
home/student/Documents/
home/student/Documents/toonveld.awk
home/student/Documents/forever.sh
home/student/Documents/partitietabel.sdx.sfdisk
student@ubuntudesktop01:~$
```

- absoluut pad:

  - geschikt voor back-up en exacte recovery

```
student@ubuntudesktop01:~$ tar -Pcf /tmp/mydocuments.tar /home/student/Documents/
student@ubuntudesktop01:~$ tar -tf /tmp/mydocuments.tar
tar: Removing leading `/' from member names
/home/student/Documents/
/home/student/Documents/toonveld.awk
/home/student/Documents/forever.sh
/home/student/Documents/partitietabel.sdx.sfdisk
student@ubuntudesktop01:~$
```

PXL

tar: archiefbestanden uitpakken

- pak de inhoud uit in de huidige directory

```
student@server2:/tmp$ sudo tar -xf home.tar
student@server2:/tmp$ ls
home    home.tar    home.tar.gz    home.tbz2    system-bu.tar
```

- unzip en pak de inhoud uit in de huidige directory

```
student@server2:/tmp$ tar -zxf home.tar.gz
```

of
```
student@server2:/tmp$ tar -jxf home.tbz2
```

- pak de inhoud uit en plaats de inhoud in een bepaalde directory
  - -C   change 'to' directory

```
student@server2:/tmp$ tar -xf system-bu.tar -C /tmp/testdir/
student@server2:/tmp$ ls testdir/
home    root    srv    var
```

directory moet bestaan

Builden van de source

- Benodigdheden
  - build-essential
    - indien deze packages niet geïnstalleerd zijn by default
    - bevat gcc-compiler en libraries nodig om van source te compileren
    - sudo apt install build-essential

Installeren van source in 4 stappen

- Downloaden en uitpakken van source-code
- ./configure
  - Checken van de systeemvariabelen, of de nodige libraries voorhanden zijn en in welke mappen de uiteindelijke gecompileerde code terecht moet komen
  - Optioneel kan je mbv opties bepaalde functionaliteiten aan of uitzetten
  - Maakt een Make-file aan uit deze informatie
- make
  - Compileren van de source-code mbv de Make-file
- sudo make install
  - de gecompileerde bestanden in de juiste mappen kopiëren (met sudo voor de juiste rechten)

Installeren van source - voorbeeld

- Installeren van build-essential
  - sudo apt install build-essential

- Downloaden van de source-code
  - wget http://curl.haxx.se/download/curl-7.39.0.tar.gz
  - tar -xzvf curl-7.39.0.tar.gz
  - cd curl-7.39.0

- ./configure

- make

- sudo make install

- Je kan het programma nu uitvoeren met curl <url>

```
student@server2:~/curl-7.39.0$ curl https://www.pxl.be/ > indexpaginavanPXL.html
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 51582  100 51582    0     0  88781      0 --:--:-- --:--:-- --:--:-- 88781
student@server2:~/curl-7.39.0$ head -5 indexpaginavanPXL.html
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd
">

<html xmlns="http://www.w3.org/1999/xhtml">
<head>
        <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
student@server2:~/curl-7.39.0$
```

Snap

- Is een bundel van een app met zijn dependencies in een eigen filesysteem
- werkt zonder aanpassingen op meerdere distro's
- draait in zijn eigen bubbel
  - afgescheiden van andere snaps
    - dus meerdere versies naast elkaar mogelijk
    - kan wel praten met resources van het OS
  - beveiliging ingebouwd via apparmor
- kan gebruikt worden voor het aanleveren van command-line-tools, services en desktop apps
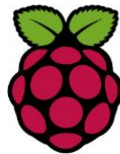- Ook gebruikt in IOT
- In Ubuntu standaard aanwezig sinds versie 16.04

Snaps

One build
for all Linux and IoT

Snaps work across many distributions and versions of Linux. Bundle your dependencies and config, simplifying installs to a single standard command.
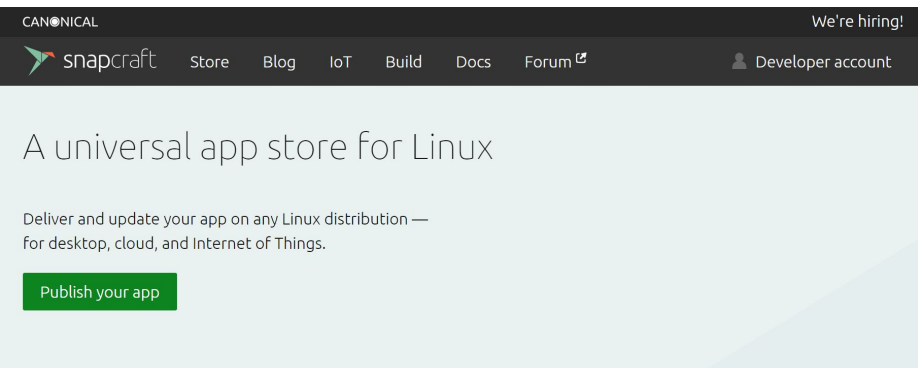
See all supported distributions

- Arch Linux
- Debian
- Deepin
- Elementary OS
- Fedora
- GalliumOS
- KDE Neon
- Linux Mint
- Manjaro Linux
- openSUSE
- Parrot Security OS
- Raspbian
- Solus
- Ubuntu
- Zorin OS

Snapcraft

- Is de tool voor developers om hun applicatie om te vormen tot een snap
  - zie snapcraft.io

snapd

- Is de daemon die zorgt voor de juiste werking van snaps

```
student@ubdesk1804:~$ systemctl status snapd
● snapd.service - Snappy daemon
   Loaded: loaded (/lib/systemd/system/snapd.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2018-12-12 13:07:59 CET; 7h ago
 Main PID: 1750 (snapd)
    Tasks: 11 (limit: 4634)
   CGroup: /system.slice/snapd.service
           └─1750 /usr/lib/snapd/snapd

dec 12 13:07:52 ubdesk1804 systemd[1]: Starting Snappy daemon...
dec 12 13:07:52 ubdesk1804 snapd[1750]: AppArmor status: apparmor is enabled and all features are available
dec 12 13:07:52 ubdesk1804 snapd[1750]: AppArmor status: apparmor is enabled and all features are available
dec 12 13:07:59 ubdesk1804 snapd[1750]: daemon.go:381: started snapd/2.36.2 (series 16; classic) ubuntu/18.04 (amd64) linux/4.15.0-39-generic.
dec 12 13:07:59 ubdesk1804 systemd[1]: Started Snappy daemon.
dec 12 16:29:19 ubdesk1804 snapd[1750]: api.go:1063: Installing snap "vlc" revision unset
student@ubdesk1804:~$
```

PXL

Ubuntu Core

- Een snap draait zijn eigen filesysteem in een bubbel. Dit filesysteem noemt men Ubuntu Core.

The smallest Ubuntu

Ubuntu Core is smaller than competing "micro" container OS offerings. It is small because it's really just a base filesystem. Apps are delivered as snaps, alongside a free choice of container runtimes and coordination systems. And because it's got a smaller attack surface, it's much more secure.

Snap-bundle

- Is een file
    - dat eindigt op .snap
    - bevat een compressed filesystem (squashfs)
        - samen met de app en zijn dependencies
    - wordt dynamisch gemount op het host-OS via een loopback devices

```
student@ubdesk1804:~$ lsblk
NAME    MAJ:MIN RM    SIZE RO TYPE MOUNTPOINT
loop0     7:0    0     13M  1 loop /snap/gnome-characters/103
loop1     7:1    0   87,9M  1 loop /snap/core/5742
loop2     7:2    0  169,4M  1 loop /snap/gimp/61
```
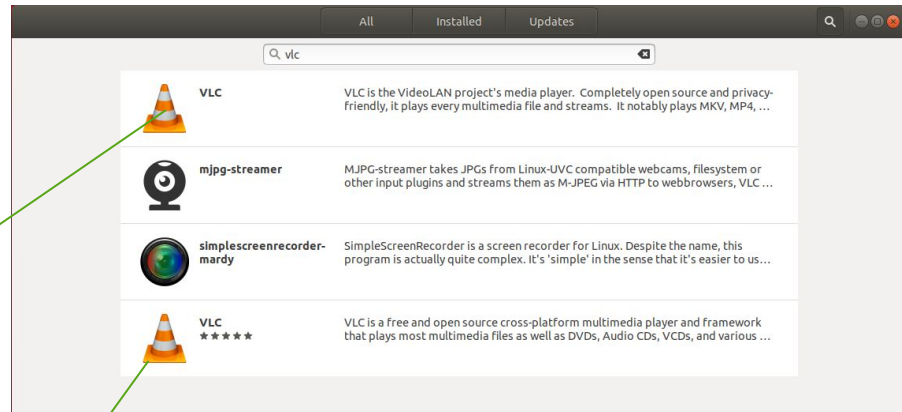
Snaps - Installeren

- te installeren via
  - de Ubuntu store
  - de app store (snapcraft.io/store)
  - websites van ontwikkelaars (geen automatische updates)
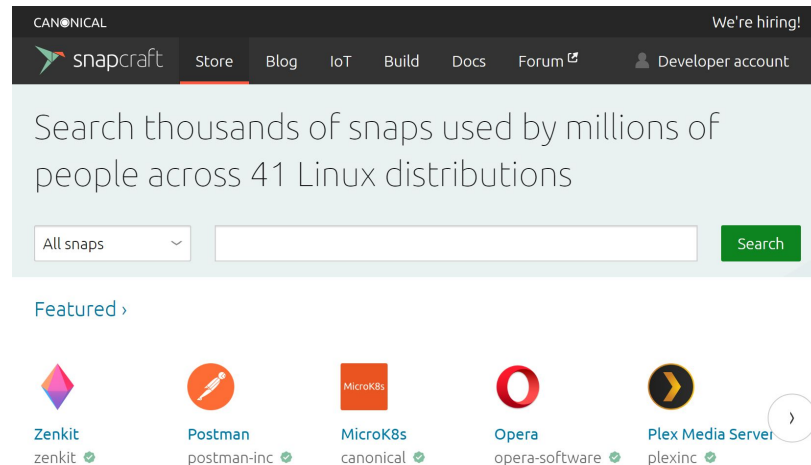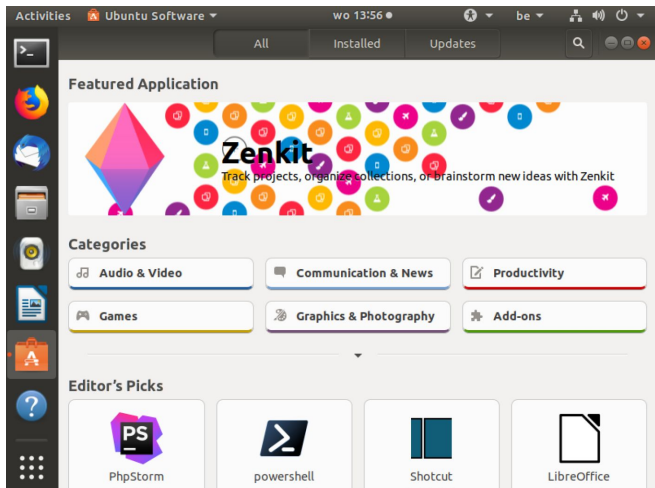
Snaps - Installeren

- ## de Ubuntu store
  - Onderaan vind je details over de app die je wil installeren:
    bvb VLC via snap vs VLC via universe

Details

Channel	stable
Version	3.0.4
License	Free
Developer	videolan
Source	Snap Store
Download Size	204,6 MB

Details

Version	3.0.4-1ubuntu0.2
Updated	Never
Category	Audio & Video → Music Players
License	Free
Developer	VideoLAN et al.
Source	ubuntu-bionic-updates-universe
Download Size	33,7 kB

Snaps - Managen via de CLI

- Zoeken naar snaps
  - snap find <searchstring>   #zoekt in name en description

```
student@ubdesk1804:~$ snap find music
Name                               Version              Publisher        Notes  Summary
deepin-music                       0.1                  xiaoguo          -      deepin-music
google-play-music-desktop-player   4.4.1                cooperteam       -      Standalone player for Google Play Music
musicarley                         2.2.0                bocata.apps      -      Music and video player free for everyone.
audovia                            3.7.1.2              songbuilder      -      Database application for making music using JFugue MusicStrings
tizonia                            0.16.0               tizonia          -      Tizonia command-line cloud music player.
musescore                          2.3.2                musescore✓       -      Create, play and print beautiful sheet music.
deadbeef-vs                        0.7.2-snap2          vs               -      The Ultimate Music Player
noson                              3.9.3.snap           janbar           -      The essential to control music from your SONOS devices
clementine                         1.3.1.36+git         kz6fittycent     -      Clementine is a modern music player.
plexmediaserver                    1.13.10.352-b71203ad9 plexinc✓        -      Plex magically organizes your media libraries and streams them to any device
picard                             2.0.4                pachulo          -      Picard is the official MusicBrainz tagger.
spotify                            1.0.94.262.g3d5c231c-9 spotify✓       -      Music for everyone
```

```
student@ubdesk1804:~$ snap find spot
Name               Version                Publisher      Notes  Summary
spotify            1.0.94.262.g3d5c231c-9 spotify✓       -      Music for everyone
tizonia            0.16.0                 tizonia        -      Tizonia command-line cloud music player.
vsslagent          1.18                   vssl           -      VSSL REST api.
easy-disk-cleaner  2.0.0                  qiplex✓        -      Find large space hogs on hard drive in seconds!  Free up disk space easily in a click!
lattam             0.2.8                  kozakrisz      -      Filmezz velünk!
musixmatch         0.21.3                 musixmatch     -      Musixmatch Desktop App
disk-space-saver   2.1.1                  qiplex✓        -      Disk Space Analyzer that you will love!
magnesium          1.6.17                 robblue2x      -      magnesium
```

Snaps - Managen via de CLI

- Oplijsten van geïnstalleerde snaps
  - snap list [--all]

```
student@ubdesk1804:~$ snap list
Name                  Version          Rev    Tracking     Publisher       Notes
core                  16-2.36.2        6034   stable       canonical✓      core
core18                18               442    stable       canonical✓      base
gimp                  2.10.8           83     stable       snapcrafters    -
gnome-3-26-1604       3.26.0           74     stable/…     canonical✓      -
gnome-calculator      3.30.1           260    stable/…     canonical✓      -
gnome-characters      3.30.0           139    stable/…     canonical✓      -
gnome-logs            3.30.0           45     stable/…     canonical✓      -
gnome-system-monitor  3.30.0           57     stable/…     canonical✓      -
gtk-common-themes     0.1-4-g88bc1b2   818    stable/…     canonical✓      -
```

```
student@ubdesk1804:~$ snap list gimp --all
Name   Version   Rev   Tracking   Publisher       Notes
gimp   2.10.6    57    stable     snapcrafters    disabled
gimp   2.10.8    61    stable     snapcrafters    disabled
gimp   2.10.8    83    stable     snapcrafters    -
student@ubdesk1804:~$
```

Snaps - Managen via de CLI

- Informatie over een snap
  - snap info <snapname>

```
student@ubdesk1804:~$ snap info spotify
name:      spotify
summary:   Music for everyone
publisher: Spotify✓
contact:   https://community.spotify.com/t5/Desktop-Linux/bd-p/desktop_linux
license:   Proprietary
description: |
  Love music? Play your favorite songs and albums free on Linux with Spotify.

  Stream the tracks you love instantly, browse the charts or fire up readymade playlists in every
  genre and mood. Radio plays you great song after great song, based on your music taste. Discover
  new music too, with awesome playlists built just for you.

  Stream Spotify free, with occasional ads, or go Premium.

    ...

    ...

snap-id: pOBIoZ2LrCB3rDohMxoYGnbN14EHOgD7
channels:
  stable:    1.0.94.262.g3d5c231c-9 (28) 182MB -
  candidate: 1.0.94.262.g3d5c231c-9 (28) 182MB -
  beta:      ↑
  edge:      1.0.94.262.g3d5c231c-9 (28) 182MB -
```
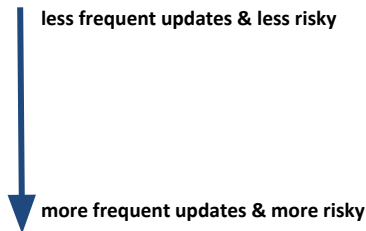
Snaps - Managen via de CLI

- installeren van een snap
  - snap install [--stable|--candidate|--beta|--edge] <snapname>
    - channels
      - stable
      - candidate
      - beta
      - edge

less frequent updates & less risky

more frequent updates & more risky

```
student@ubdesk1804:~$ sudo snap install vlc
Download snap "vlc" (555) from channel "stable"                    60% 2.97MB/s 27.4s
```

...

```
student@ubdesk1804:~$ sudo snap install vlc
vlc 3.0.4 from VideoLAN✓ installed
student@ubdesk1804:~$
```

Snaps - Managen via de CLI

- Refreshen van een snap
  - Snaps worden iedere dag automatisch geupdated

  - Handmatig kan ook via
    - snap refresh <snapname>

```
student@ubdesk1804:~$ sudo snap refresh gimp
snap "gimp" has no updates available
student@ubdesk1804:~$
```

Snaps - Managen via de CLI

- Aanpassen van een channel van een snap
  - snap switch --channel=[stable|beta|…] <snapname>

  - Onmiddellijk aanpassen van de snap naar een nieuwe channel
    - snap refresh --channel=[stable|beta|…] <snapname>

  - Deze tracking zie je bij "snap info <snapname>"

```
student@ubdesk1804:~$ snap info gimp | grep tracking
tracking:        stable
student@ubdesk1804:~$ _
```
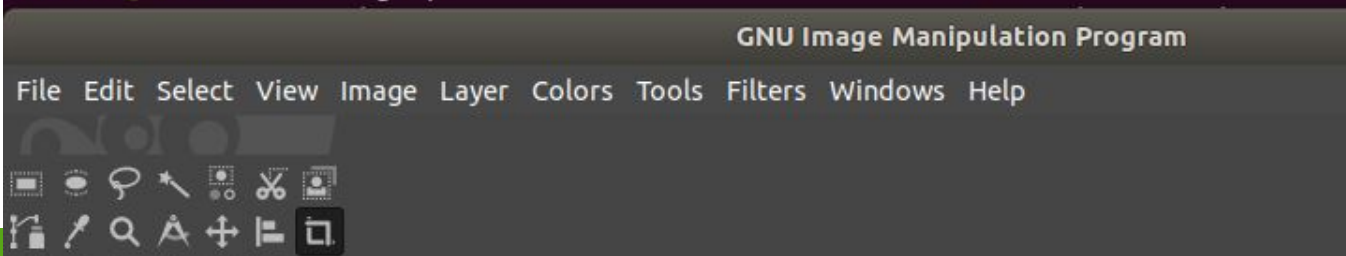
Snaps - Managen via de CLI

- Starten van een snap
  - snaps worden geïnstalleerd in: /snap/bin

```
student@ubdesk1804:~$ ls /snap/bin/
gimp  gnome-calculator  gnome-characters  gnome-logs  gnome-system-monitor
```

  - worden via de PATH-variabele gevonden

```
student@ubdesk1804:~$ which gimp
/snap/bin/gimp
```

  - Dus uitvoeren kan met of zonder het volledig pad

```
student@ubdesk1804:~$ gimp
```
GNU Image Manipulation Program

File Edit Select View Image Layer Colors Tools Filters Windows Help

Snaps - Managen via de CLI

- Starten van een snap
  - lijst tonen van geïnstalleerde snaps met
    - snap list

```
student@ubdesk1804:~$ snap list
Name                Version      Rev    Tracking     Publisher       Notes
core                16-2.36.2    6034   stable       canonical✓      core
core18              18           442    stable       canonical✓      base
gimp                2.10.8       83     stable       snapcrafters    -
gnome-3-26-1604     3.26.0       74     stable/      canonical✓      -
```

  - snap runnen met
    - snap run <snapname>

```
student@ubdesk1804:~$ snap run gimp
```

GNU Image Manipulation Program

File Edit Select View Image Layer Colors Tools Filters Windows Help
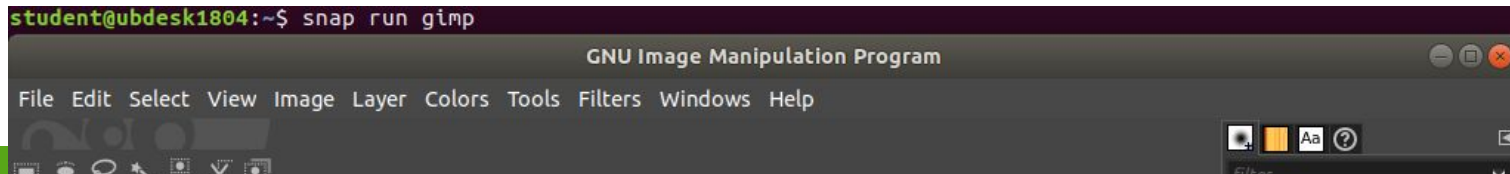
Snaps - Managen via de CLI

- Starten van een snap bij meerdere versies
  - Je kan de snap zoeken met
    - ls /snap/bin

```
student@ubdesk1804:~$ ls /snap/bin/
gimp  gnome-calculator  gnome-characters  gnome-logs  gnome-system-monitor
```

  - We kunnen een welbepaalde snap dan uitvoeren door zijn volledig pad op te geven
    - /snap/bin/<snapname>

```
student@ubdesk1804:~$ /snap/bin/gimp
```

GNU Image Manipulation Program

File Edit Select View Image Layer Colors Tools Filters Windows Help
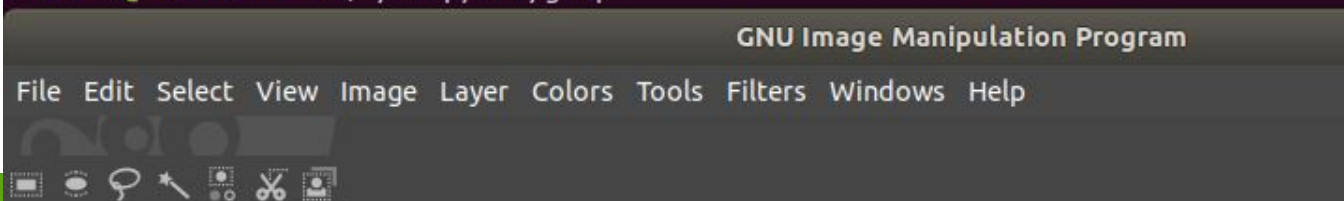
Snaps - Managen via de CLI

- Terugdraaien naar een vorige revisie
  - om de revisies te zien
    - snap list <snapname> --all

```
student@ubdesk1804:~$ snap list gimp --all
Name   Version  Rev  Tracking  Publisher     Notes
gimp   2.10.6   57   stable    snapcrafters  disabled
gimp   2.10.8   61   stable    snapcrafters  disabled
gimp   2.10.8   83   stable    snapcrafters  -
student@ubdesk1804:~$
```

  - om terug te gaan naar een vorige revisie
    - snap revert <snapname>

```
student@ubdesk1804:~$ sudo snap revert gimp
gimp reverted to 2.10.8
student@ubdesk1804:~$ sudo snap revert gimp
gimp reverted to 2.10.6
```

Is nu rev. 57

Snaps - Managen via de CLI

- Een snap disablen/enablen
  - snap disable|enable <snapname>

```
student@ubdesk1804:~$ sudo snap disable gimp
gimp disabled
student@ubdesk1804:~$ gimp
bash: /snap/bin/gimp: No such file or directory
student@ubdesk1804:~$ sudo snap enable gimp
gimp enabled
student@ubdesk1804:~$ gimp
```
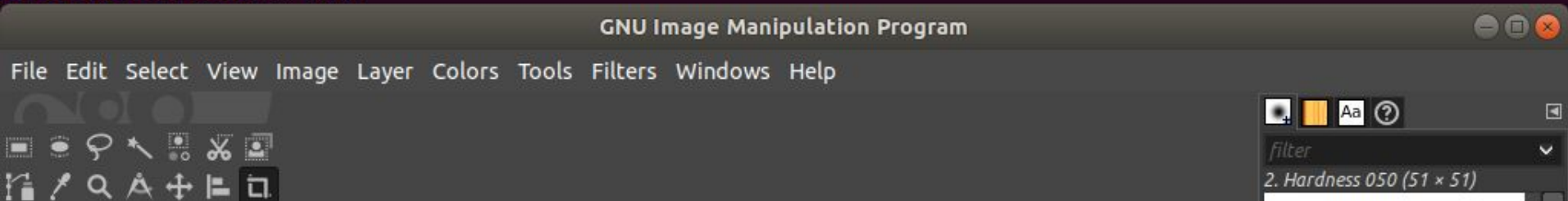
Snaps - Managen via de CLI

- Verwijderen van een snap
  - snap remove <snapname>

```
student@ubdesk1804:~$ sudo snap remove vlc
vlc removed
student@ubdesk1804:~$
```

Snaps - Managen via de CLI

- ## Aanpassing van de snap-daemon bekijken
  - snap changes