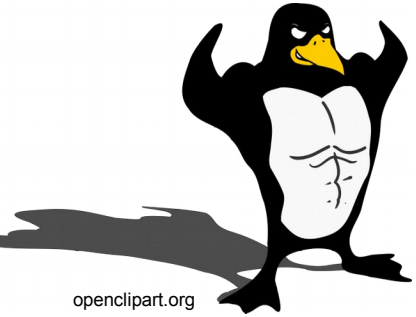
TheAlternative.ch
for a sustainable digital world

LinuxDays

The Power of Linux



Lecturer: Sandro Kalbermatter

HS16, v1

Purpose of this course

- You now have Linux – what to do with it?
- Many of our former participants installed Linux but didn't switch to it in their daily workflow
- This course shows a few examples of tasks Linux is particularly good at, giving you ideas what to use it for
- The more creative you are, the more applications you will find in your everyday life
- This is not supposed to be a flame-war against Windows or Mac OS, but we will be comparing against them.

TheAlternative.ch
for a sustainable digital world

...get to love your new system! :-)

BASIC

Stuff that you can already do

TheAlternative.ch
for a sustainable digital world

Automatic update and shutdown

```
sandro@linux-gttg:~> sudo su
root's password:
linux-gttg:/home/sandro # zypper ref && zypper -n up && poweroff
```

- sudo su: become root permanently
- zypper ref: force check for updates now
- zypper -n up: install updates,
  -n: don't ask for confirmation
- poweroff: shut down PC
- A && B : if A completed successfully, do B
- Unattended → potentially dangerous!

TheAlternative.ch
for a sustainable digital world

Creating an ad-hoc network

- using Networkmanager (Live Demo!)
- Sharing your network connection:
  - LAN to WLAN
  - WLAN to LAN
- Gaming in the train
- vs. Win: Removed in Windows 8 and higher!

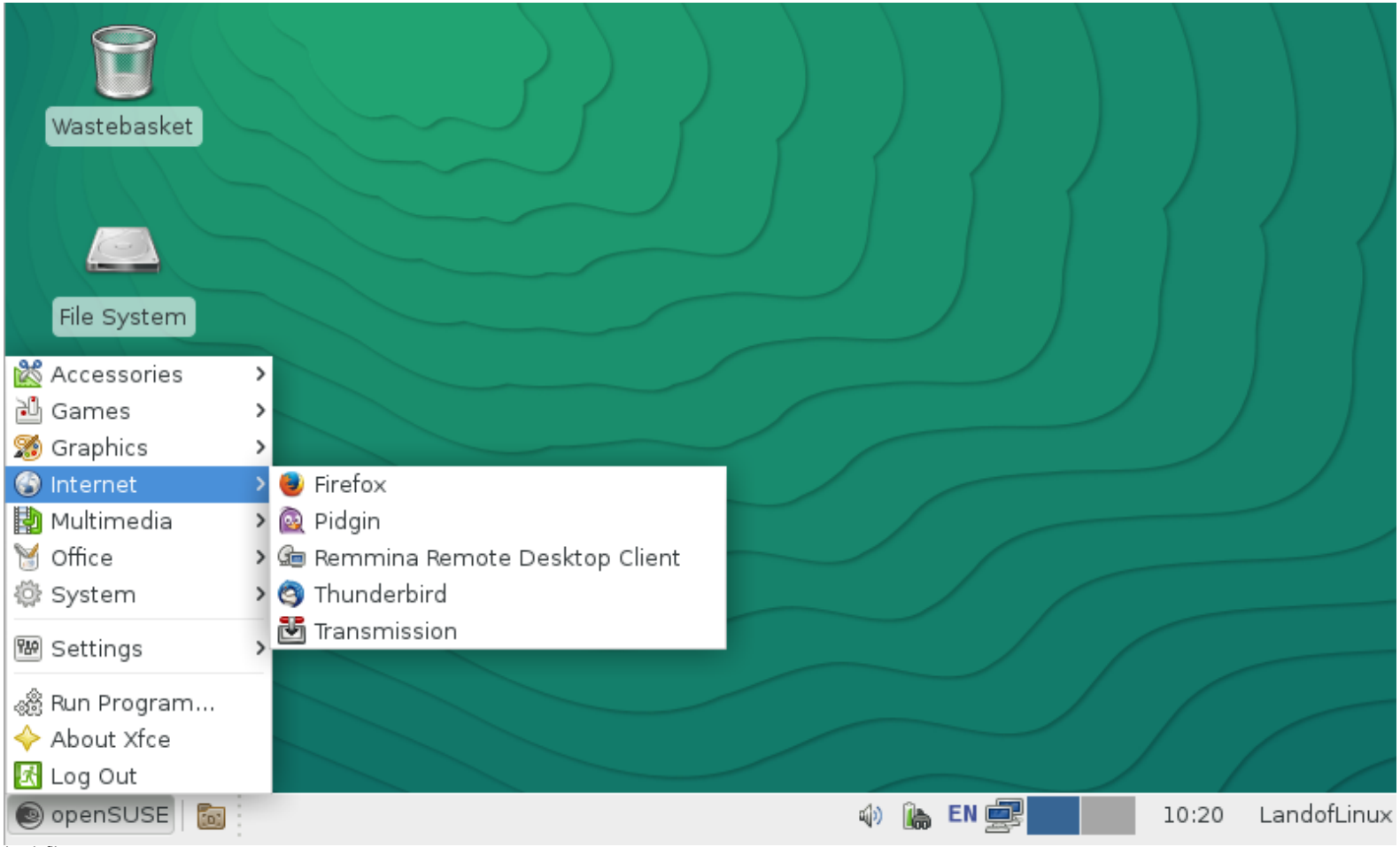
TheAlternative.ch
for a sustainable digital world

You're free to replace anything you don't like

- e.g. start menus: xfce menus, kupfer, dmenu
- e.g. clipboards: std., glipper, copyq
- e.g. file managers: nemo, spacefm, ranger
- e.g. shells: bash, fish, zsh; – tmux

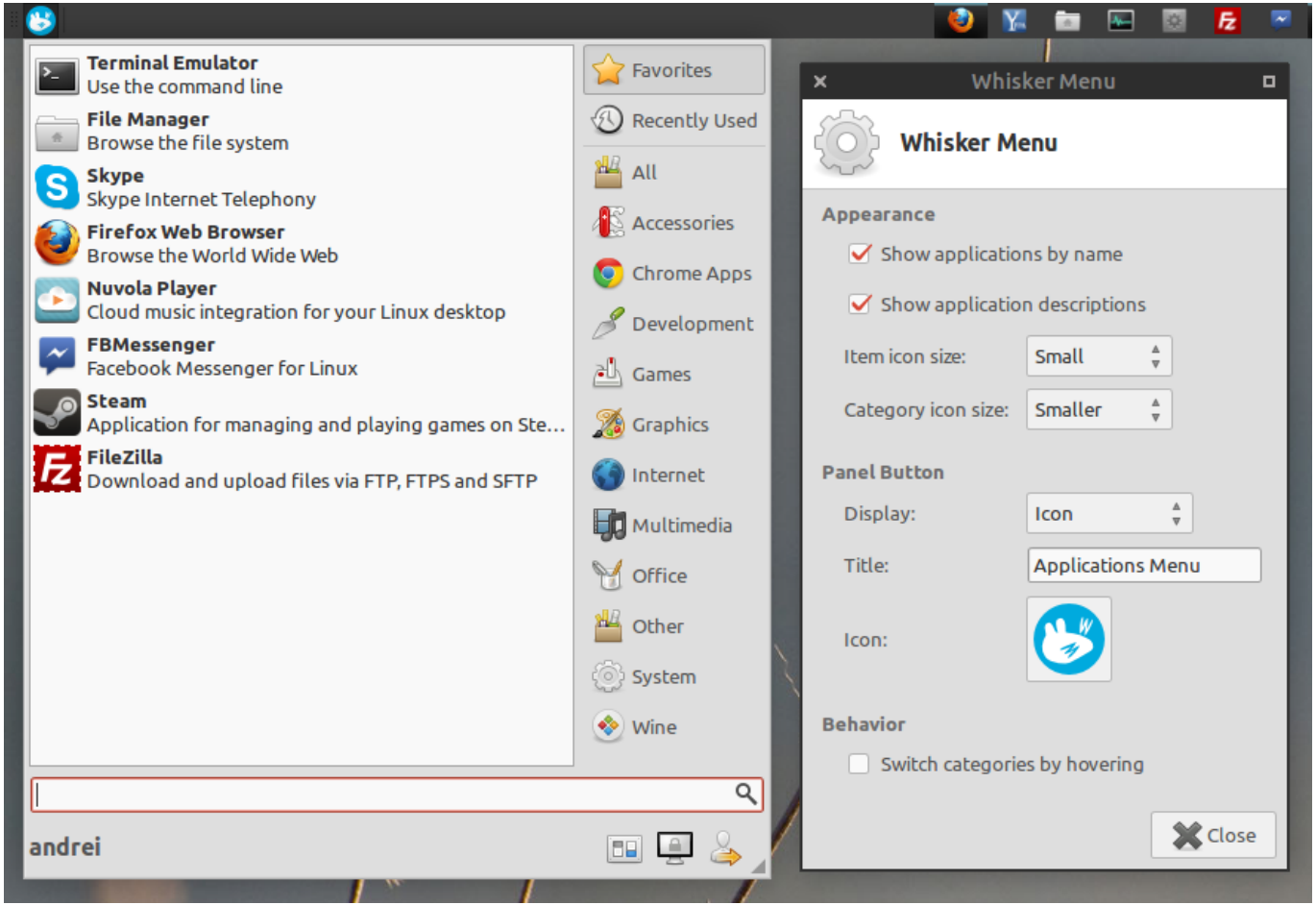
TheAlternative.ch
for a sustainable digital world

Start Menus: XFCE default menu



TheAlternative.ch
for a sustainable digital world

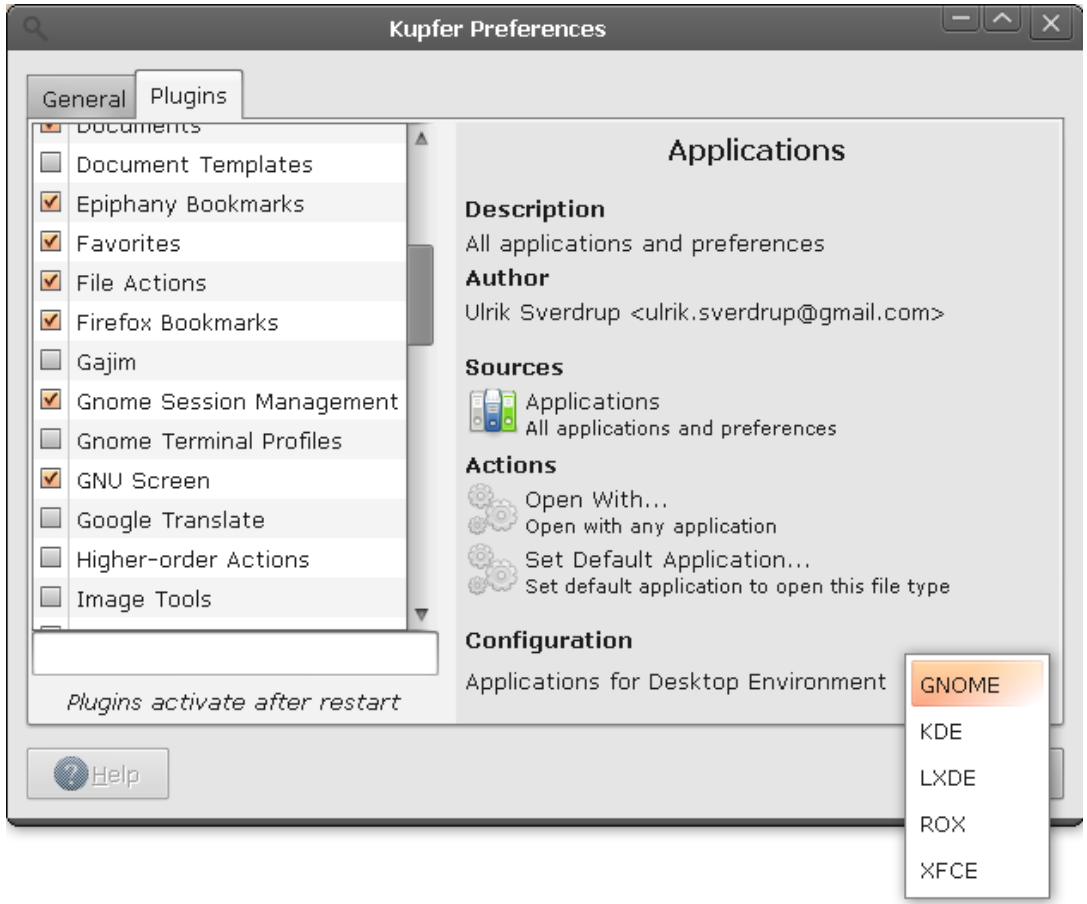
Start Menus: XFCE Whiskermenu



webupd8.org

Start Menus: Kupfer

2x webupd8.org



TheAlternative.ch
for a sustainable digital world

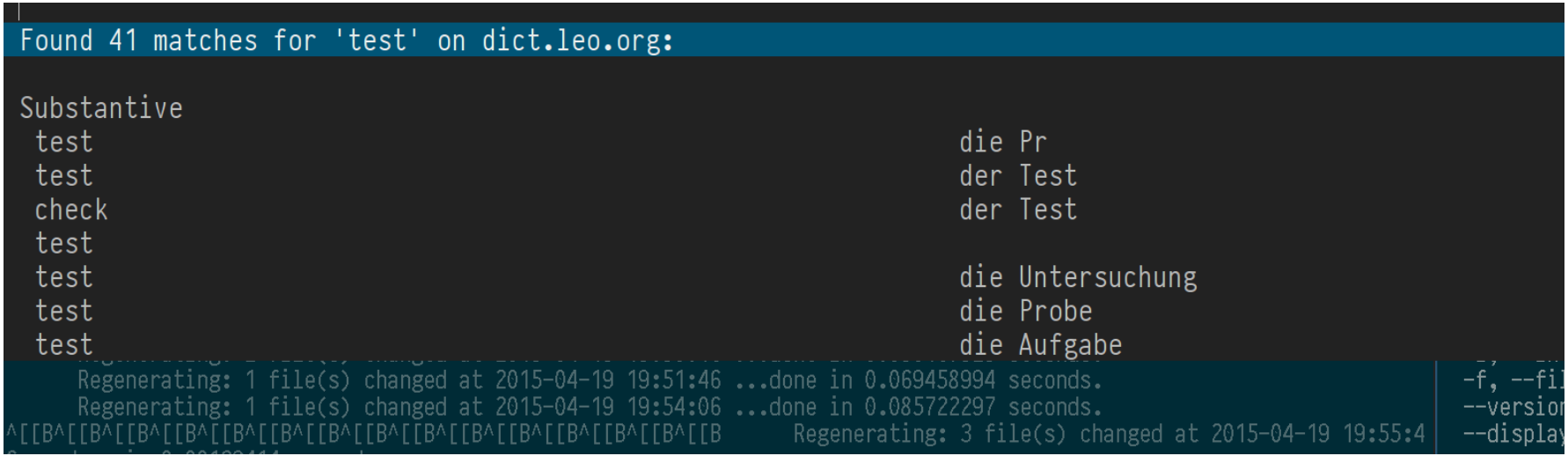
Start Menus: dmenu

- Super compact and lightweight (live demo)

TheAlternative.ch
for a sustainable digital world

Start Menus: dmenu

- Super compact and lightweight (live demo)
- Yet incredibly powerful



TheAlternative.ch
for a sustainable digital world

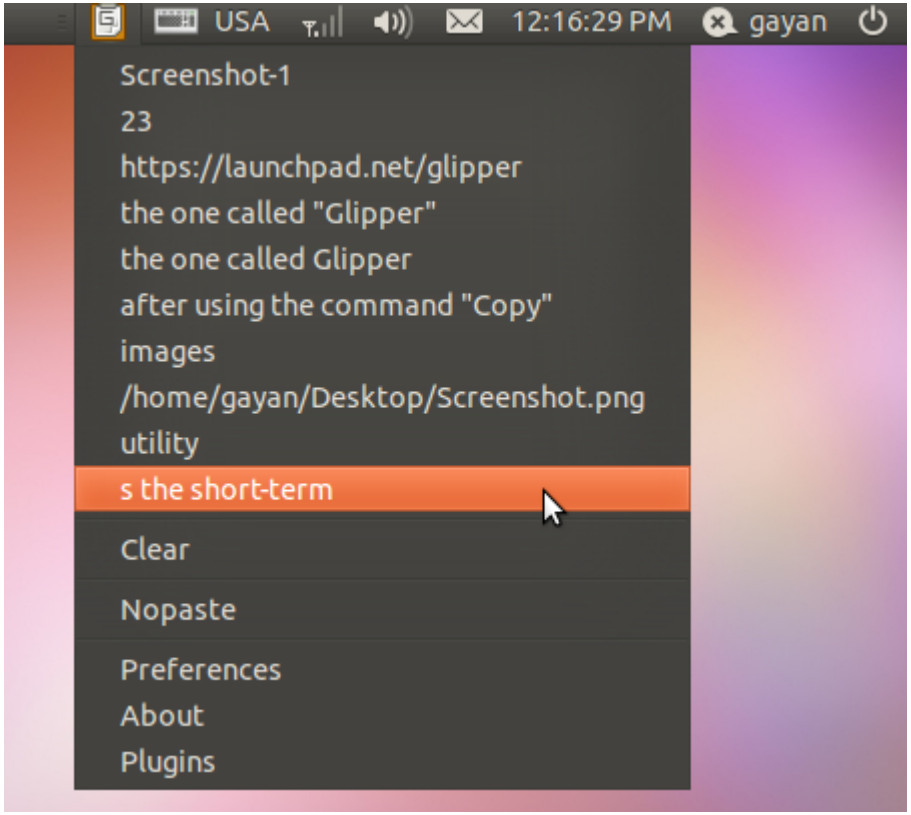
Clipboards: the standard clipboards

- Most distros come with 2 integrated clipboards:
- Whenever you select a text, it is copied
  - Paste using middle click (live demo)
- Ctrl+C, Ctrl+V
- Clipboards are independent
  - can keep 2 different values

TheAlternative.ch
for a sustainable digital world

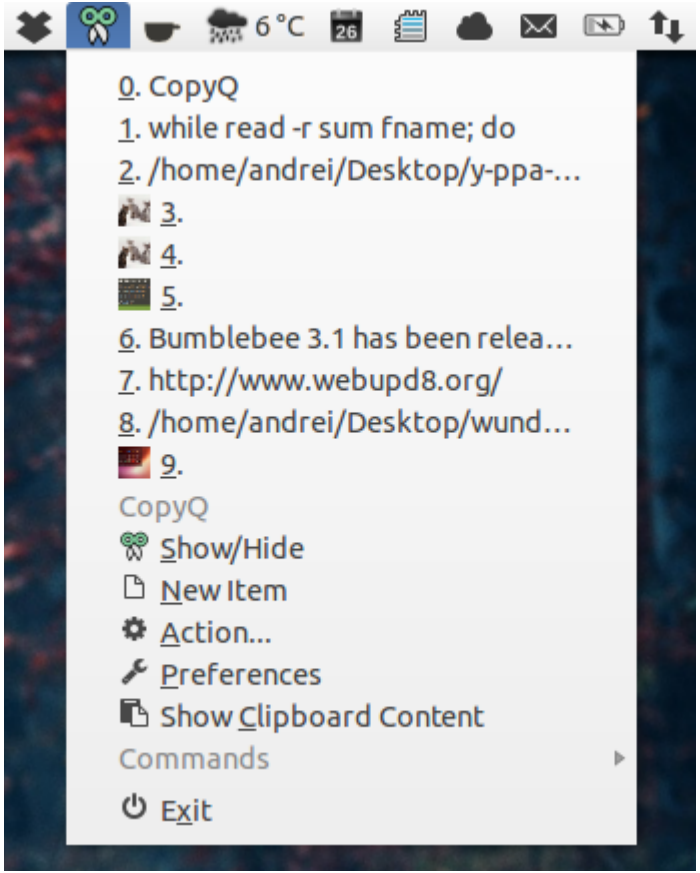
Clipboards: Glipper

- Stores multiple items

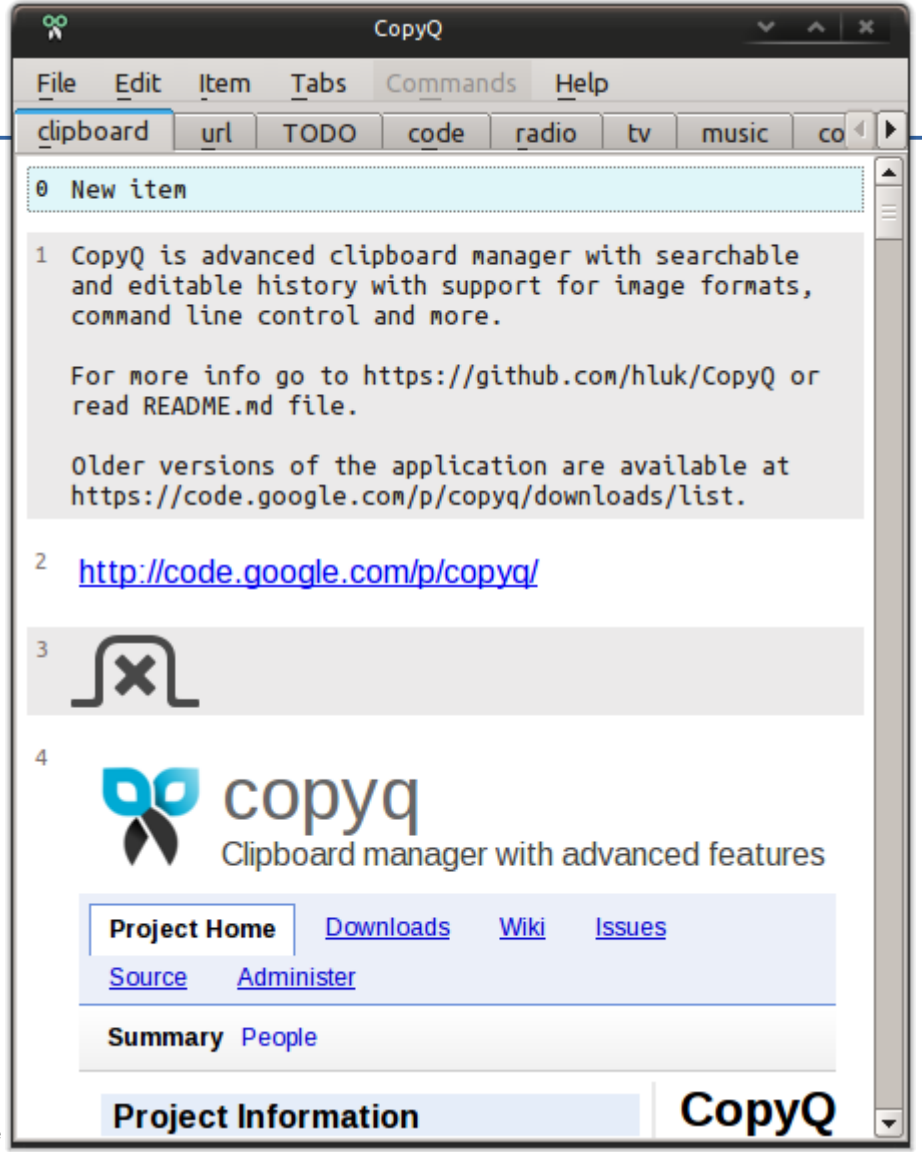


hecticgeek.com

Clipboards: CopyQ

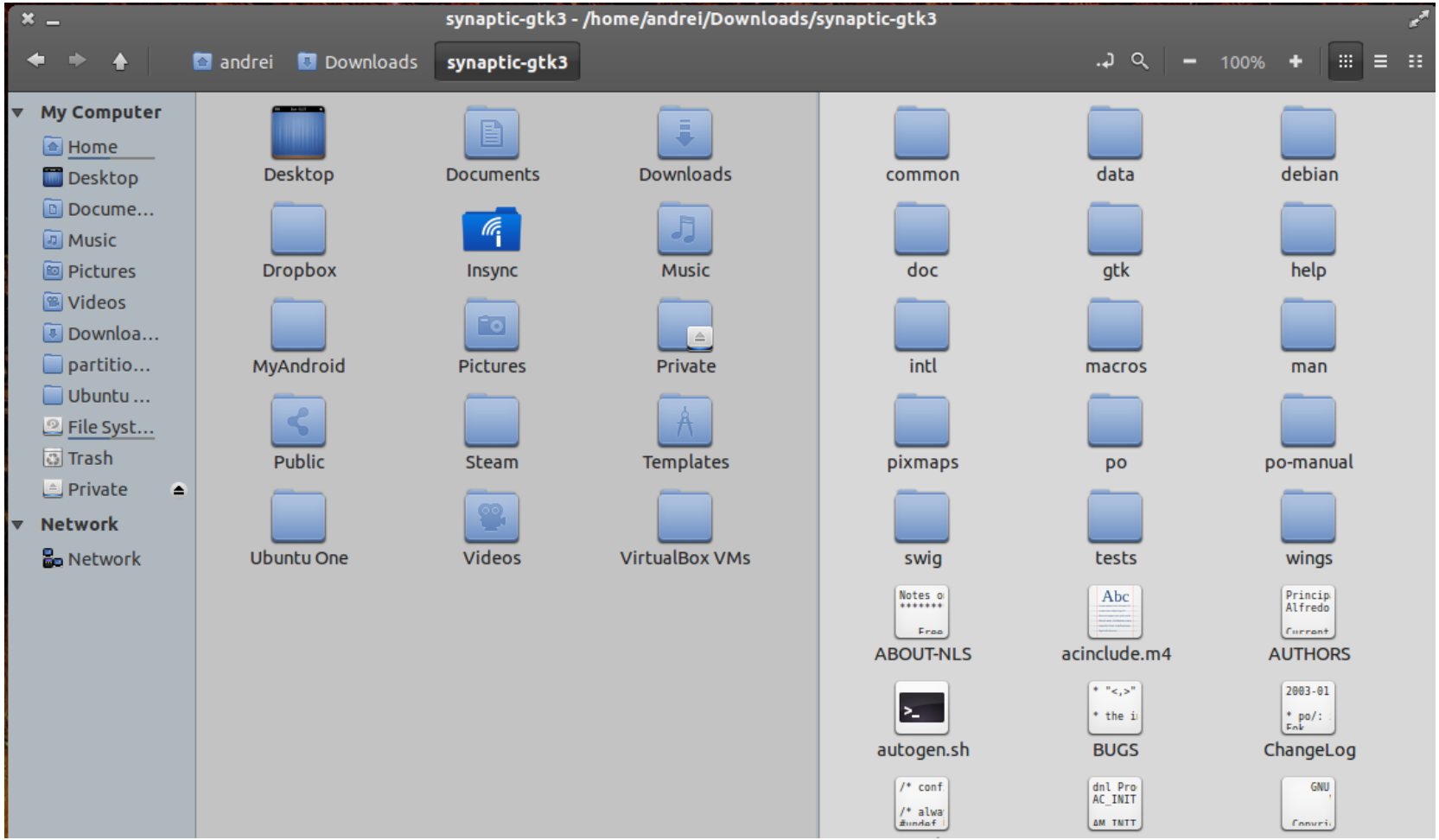


webupd.com



CopyQ website

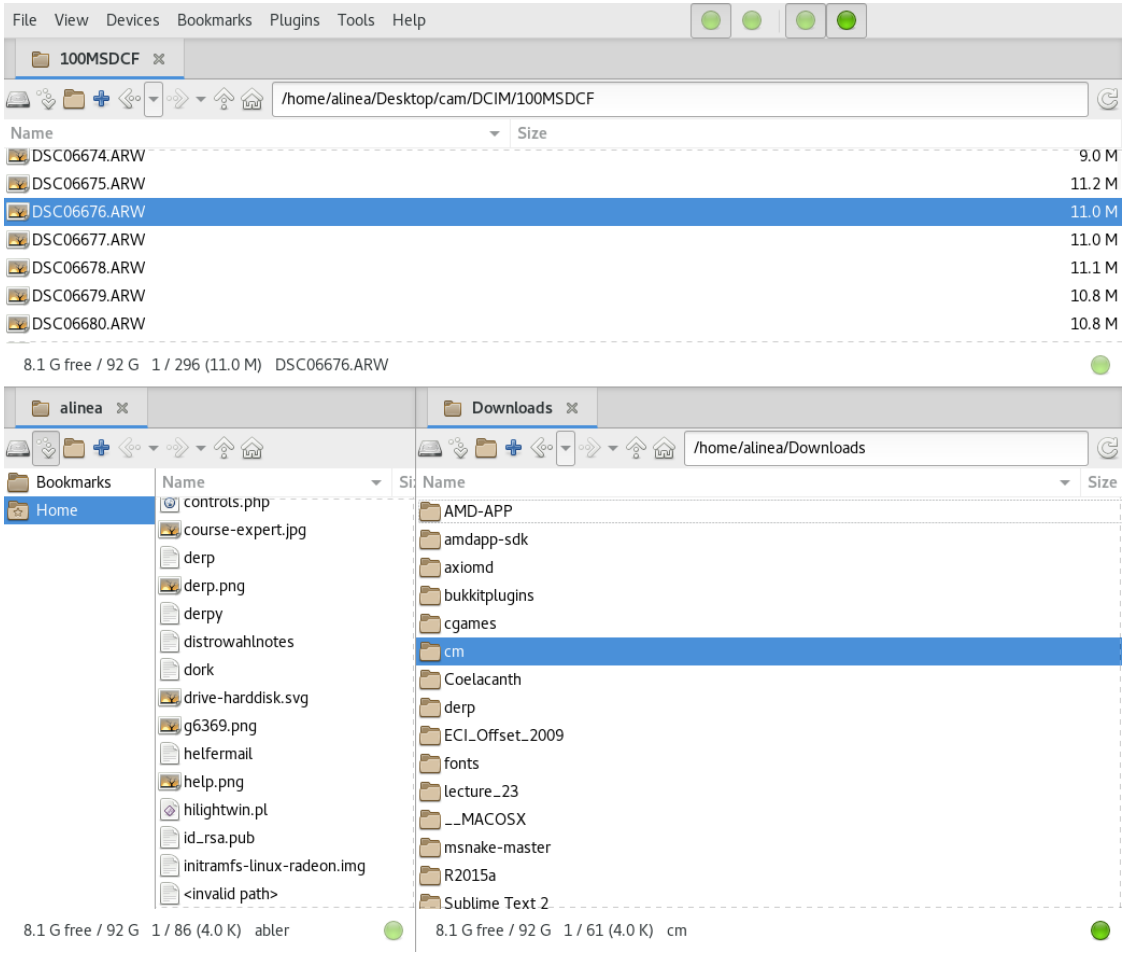
File Managers: Nemo



img.netupd8.com

TheAlternative.ch
for a sustainable digital world

File Managers: SpaceFM

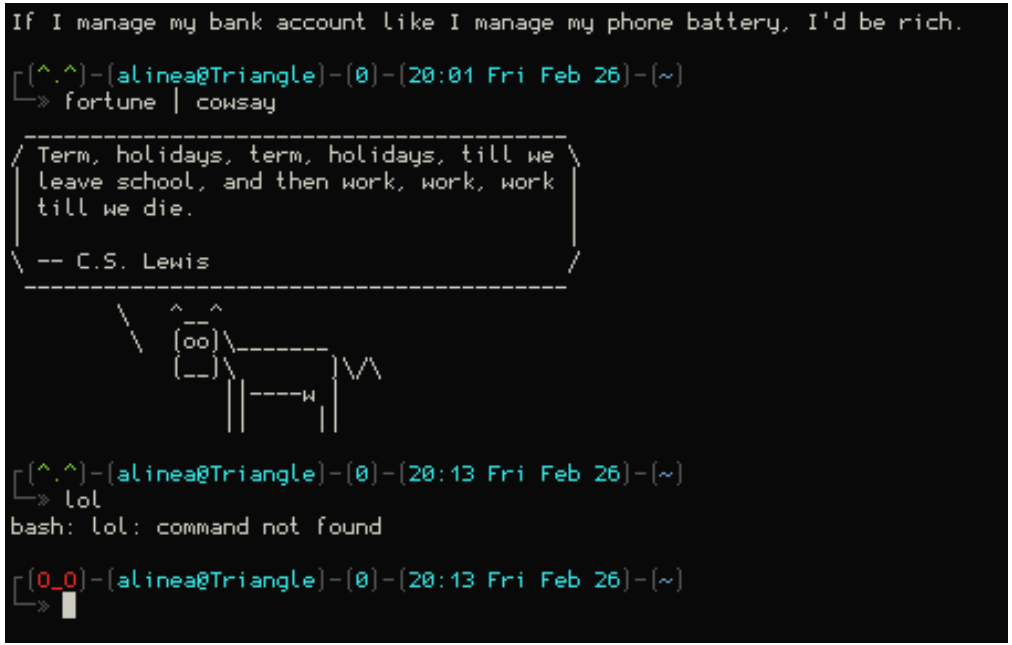


TheAlternative.ch
for a sustainable digital world

File Managers: Ranger

Shells: Bash

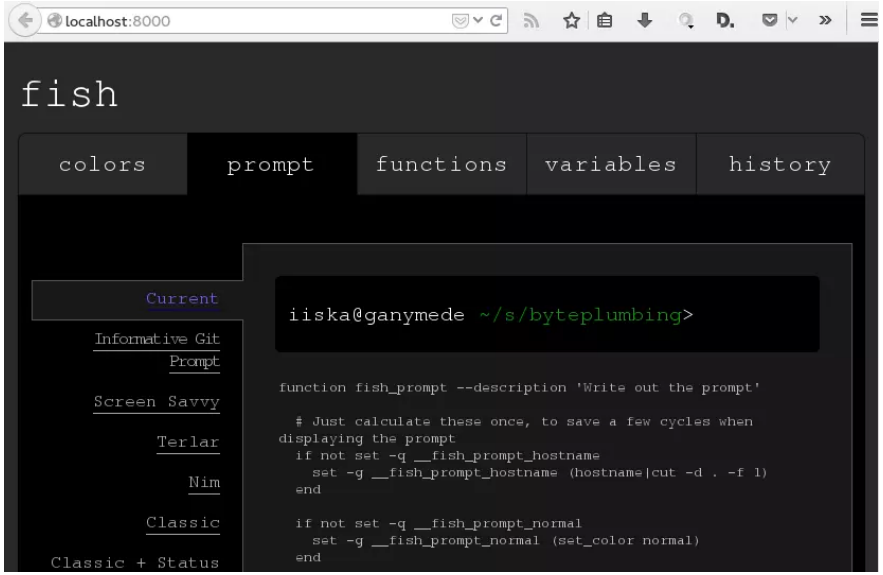
- This is the shell you already know
- Use Arrow Keys and Ctrl+R to go through your command history
- You can personalize it using .bashrc



TheAlternative.ch
for a sustainable digital world

Shells: Fish

- The Friendly Interactive Shell, good for lazy people (like me)
- Shows autocompletion while typing
- Type + Arrows to search
- Configure in web browser



byteplumbing.net

```
nate@blackbox ~/lwn> help fish_right_prompt
help: Help is being displayed in xdg-open.
nate@blackbox ~/lwn>
(process:29259): GLib-CRITICAL **: g_slice_set_config: assertion `sy
e == 0' failed

nate@blackbox ~/lwn> pwd
/home/nate/lwn
nate@blackbox ~/lwn> ma
nate@blackbox ~/lwn> mat
match_parens                (Executable link, 3.3kB)
matchpoint  (Run feature detection and extraction)
math
mathspic                    (Executable link, 125kB)
mattrib        (Change MSDOS file attribute flags)
nate@blackbox ~/lwn> mar
marble                                    (Executable, 436kB)
markdown-calibre                       (Markdown tool for calibre)
markdown_py  (A Python implementation of John Gruber's Markdown.)
nate@blackbox ~/lwn> marble
```

lwn.net

TheAlternative.ch
for a sustainable digital world

Shells: ZSH

- Z-Shell
- Many themes/extensions/configuration frameworks
- Lots of features
- First start will setup a basic config file

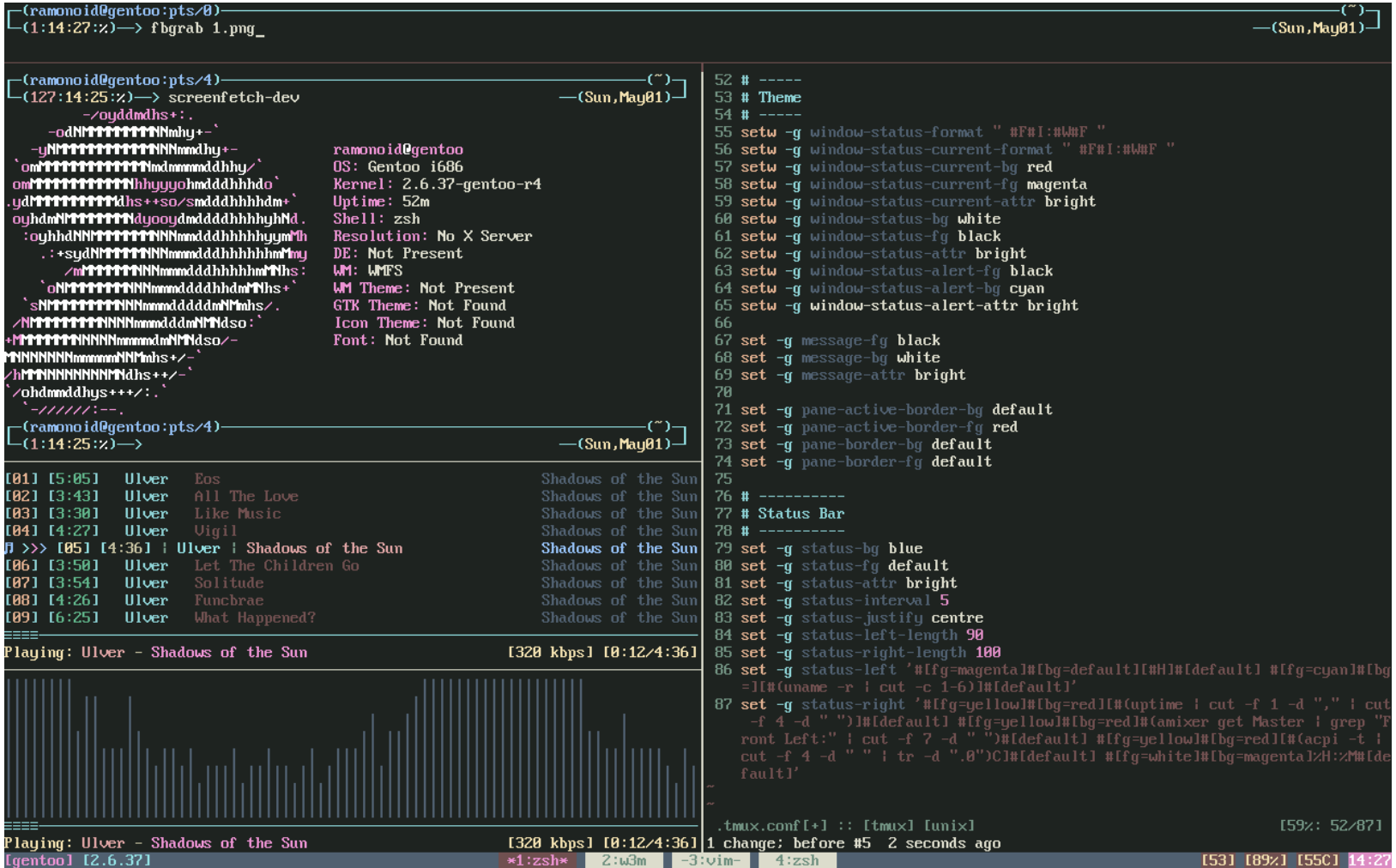
```
~ sources packages  master
~ sources packages  master tar
A  -- append to an archive
c  -- create a new archive
f  -- specify archive file or device
t  -- list archive contents
u  -- update archive
v  -- verbose output
x  -- extract files from an archive
~ sources packages  master git commit -m"Import IDs (aka keys) from XML into Proceedings and InProceedings"
bck-i-search: com_
```

TheAlternative.ch
for a sustainable digital world

Shells: tmux

- tmux is not a shell!
- ...it's a container for shells
- Open multiple shells in the same window
- Remains open when your terminal crashes
  - or if you accidentally close it
  - or if it's remote and your connection breaks
- Simply re-attach to it to get your session back

Shells: tmux



dotshare.it

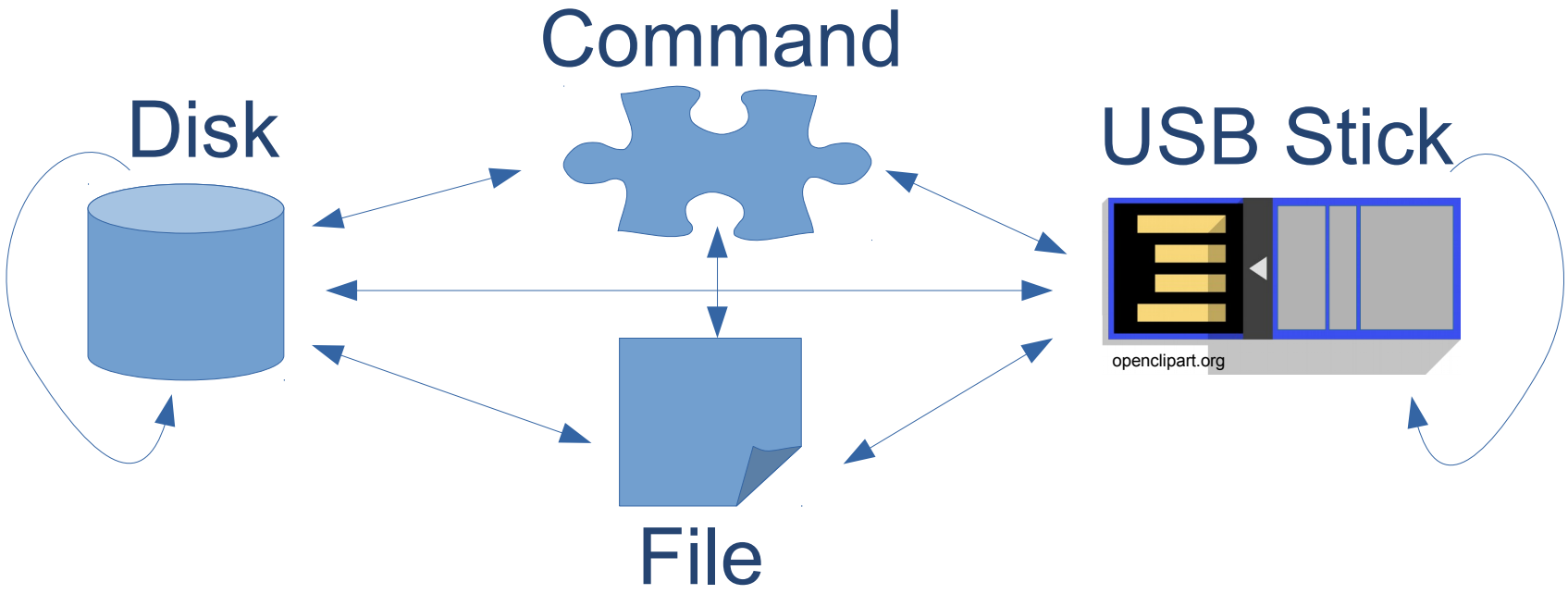
TheAlternative.ch
for a sustainable digital world

Redirect output

- Redirect output using > (append with >>)
  - `echo "created on $(date)" > massCopy.log`
- Redirect error output using 2> or 2>>
  - `cp ~/* /media/target 2>> massCopy.log`
- Pipe data with |
  - `ls | wc`
  - `find . | grep 'hello'`

dd

- Bitwise copy: Create exact copies on low level
- Can pipe to commands, e.g. pbzip2



TheAlternative.ch
for a sustainable digital world

dd

- if=..., of=...: input / output file or device
- bs=4M: set block size to 4 MB (faster copy)
- status=progress: show a progress bar

- Replace … by a device or file:

```
sudo dd if=/dev/sr0 of=image-of-cd.iso
```

  Input file: The CD drive

  Output file: a file that will become the iso

- WARNING: target will be overwritten! (dd = “disk destroy”)

TheAlternative.ch
for a sustainable digital world

dd

- Creating an OpenSUSE boot stick from CD image:

  ```
  sudo dd if=openSUSE-Leap-42.1-DVD-x86_64.iso of=/dev/sdb bs=4M
  ```

  Input file is the CD image

  Output file is the entire USB key (no number specified)

  Blocksize 4MB for faster copy to USB disk

- pbzip2 is a command that compresses
  - Has multi-core processor support
  - Can copy your disk and compress it in real-time!
  - `sudo dd if=/dev/sda1 | pbzip2 > archive.img.pbzip`
  - Could just as well use ...`| zip > archive.img.zip`,
    but would be slower because no multi-core support

TheAlternative.ch
for a sustainable digital world

VPN to ETH using openconnect

- Install NetworkManager-openconnect

```
sudo zypper in NetworkManager-openconnect
```

- Live Demo
  - new connection → VPN (openconnect)
  - VPN → Gateway: sslvpn.ethz.ch
  - Leave rest as is

TheAlternative.ch
for a sustainable digital world

youtube-dl

- Download any Youtube-Video
  - Video and / or
  - Audio
- List available formats:
  - `youtube-dl -F '[URL]'`
- Download video:
  - `youtube-dl -f [FORMAT] '[URL]'`
  - `youtube-dl -f 141 'https://www.youtube.com/watch?v=e4BTRB1XA-g'`

TheAlternative.ch
for a sustainable digital world

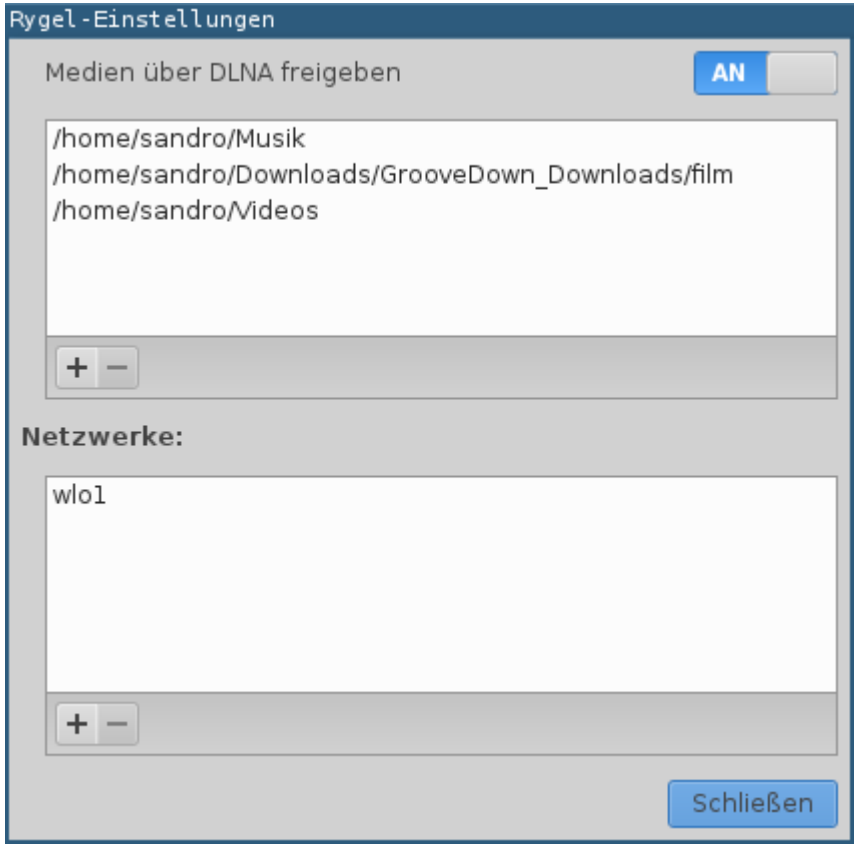
mpv

- Controlled entirely by keyboard (live demo)
- Super-fast seeking, subtitle toggeling, speed change etc. with one button
- Plays pretty much anything
- Can be run in the console
- Supports playlists
- Support for youtube-dl:
  `mpv --ytdl http://y2u.be/YE7VzlLtp-4`

TheAlternative.ch
for a sustainable digital world

Streaming media to your TV

- Rygel
- MiniDLNA
- MediaTomb



TheAlternative.ch
for a sustainable digital world

Merge or burst PDFs

- Need to merge lots of separate PDFs?
- `pdfunite [SOURCES] [DESTINATION]`
- `pdfunite ex.pdf appendix.pdf combo.pdf`
- `pdfunite course-part*.pdf merged.pdf`

- `pdfseparate [SOURCE] [DESTINATION]`
- `pdfseparate images.pdf image%d.pdf`
  - Creates image1.pdf, image2.pdf, ...

TheAlternative.ch
for a sustainable digital world

See you power consumption

- powertop (Live Demo)
  - See exactly which part of your computer uses how much power
  - Tune parameters
  - Calibrate battery
- cpupower
  - See what your CPU is doing
  - Frequencies, idle stats
  - type `cpupower` or `man cpupower` for help

TheAlternative.ch
for a sustainable digital world

Recover lost data

- photorec
  - works despite broken file system
  - recovers deleted pictures, videos, documents, ...
  - ~300 file families supported
  - live demo(?)
- dd_rescue
  - like dd, but continues despite damaged blocks
    - unreadable blocks are replaced by 0
  - use to pull all the data you can from an almost dead HDD

TheAlternative.ch
for a sustainable digital world

xrandr

- Control all your displays with a single command
- `xrandr --output [OUT] [CONFIG]`
  - If no options are given, xrandr shows current config and displays
- Put projector to recommended resolution:
  - `xrandr --output VGA-0 --auto`
  - `xrandr --output VGA-0 --auto --left-of LVDS`
  - `xrandr --output VGA-0 --same-as LVDS`
  - `xrandr --output LVDS --rotate left`
- Hint, hint: Make a script, use keyboard shortcuts :-)

TheAlternative.ch
for a sustainable digital world

Super-cool scripting

- e.g. putting your PC into movie watching mode

```
#!/bin/bash

# Turn off both PC screens
xrandr --output VGA-1 --off
xrandr --output LVDS-1 --off

# Turn off DPMS, which blanks the screen after 5 minutes of inactivity
xset s off -dpms

# set my TV as main output
xrandr --output HDMI-0 --mode 1600x900 --left-of LVDS-1

# remotely turn on my TV via the HDMI connection
echo 'on 0' | sudo cec-client -s /dev/ttyACM0

# Set a random wallpaper on the TV
feh --randomize --bg-fill /home/alinea/Files/wallpaper/*
```

TheAlternative.ch
for a sustainable digital world

Super-cool scripting

- e.g. batch convert images with imagemagick
- This script finds all the pictures my TV doesn't support...
- …and automatically converts them into a readable format
- Thousands of pictures processed in just a few minutes

```
find . -type f -print0 | \  # Find any files in the current directory
while read -d '' f; do      # and apply for each:
    # If the file is a jpg picture...
  file -b --mime-type "$f" | egrep -q '^image/jpeg$' \
    # ...and if the format is the wrong one...
  && identify -format '%[jpeg:sampling-factor]' "$f" \
  | egrep -q '^1x1,1x1,1x1$' \
    # ...convert it into the right format :-)
  && { mogrify -sampling-factor 2x1 "$f"; echo "$f"; }
done
```

TheAlternative.ch
for a sustainable digital world

Keyboard shortcuts!

- Custom screen capture
  - using `import` from the ImageMagik package
- Mastering all your music
  - e.g. Clementine (live demo!), mpd
- Absolute brightness / volume control
  - `light`
  - `pamixer`

ADVANCED

Stuff that you can easily learn by reading

TheAlternative.ch
for a sustainable digital world

Process management

- top, htop, ps
- Ctrl+Z: Pause running process
  - `fg`: Run it in foreground
  - `bg`: Run it in background
  - Can use `fg` after the use of `bg`
- kill, killall
  - `-9`, `-KILL`

TheAlternative.ch
for a sustainable digital world

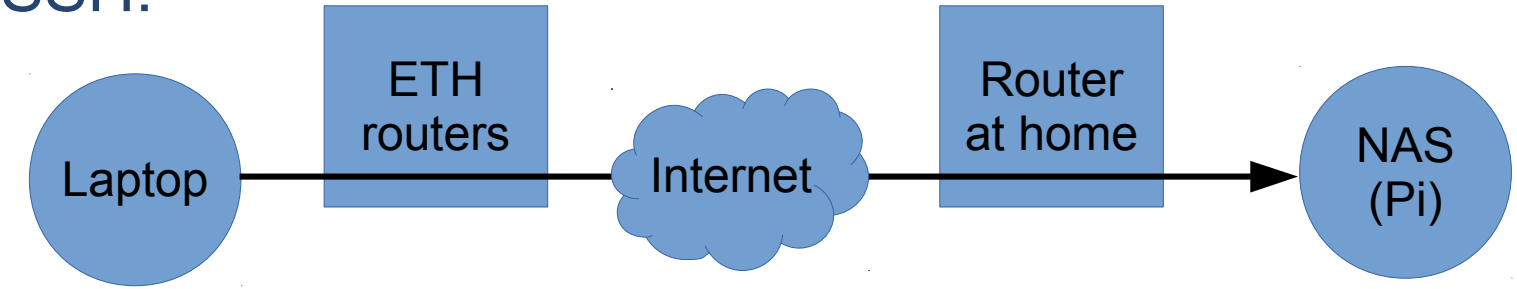
Remote machine control

- ssh: get an encrypted shell on a server
  - `ssh [USERNAME]@[MACHINE]`
  - `ssh sandroka@optimus.ethz.ch` (D-INFK only)
- scp: transfer a file via SSH (encrypted)
  - Works like cp
  - `scp myFile.pdf sandro@192.168.1.123:/media/ETH/`
- rsync: advanced file copy
  - `rsync -avh Downloads/ me@miau.ch:/some/folder/`

TheAlternative.ch
for a sustainable digital world

Master your NAS

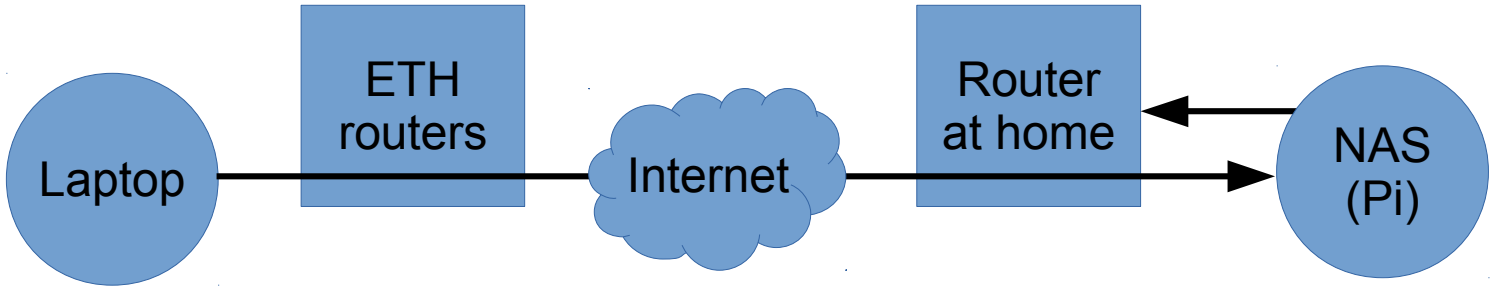
- Ex.: using a Raspberry Pi with Arch Linux ARM
  - samba for sharing files with Windows PCs
  - MiniDLNA for DLNA sharing (to TV and HiFi)
  - Syncthing for auto-synchro with PC and my Pi in Zürich
  - Kodi for HDMI media Center with CEC
  - MPD for Remote-Controlled music playback
  - SSH:



TheAlternative.ch
for a sustainable digital world

Finding your logs

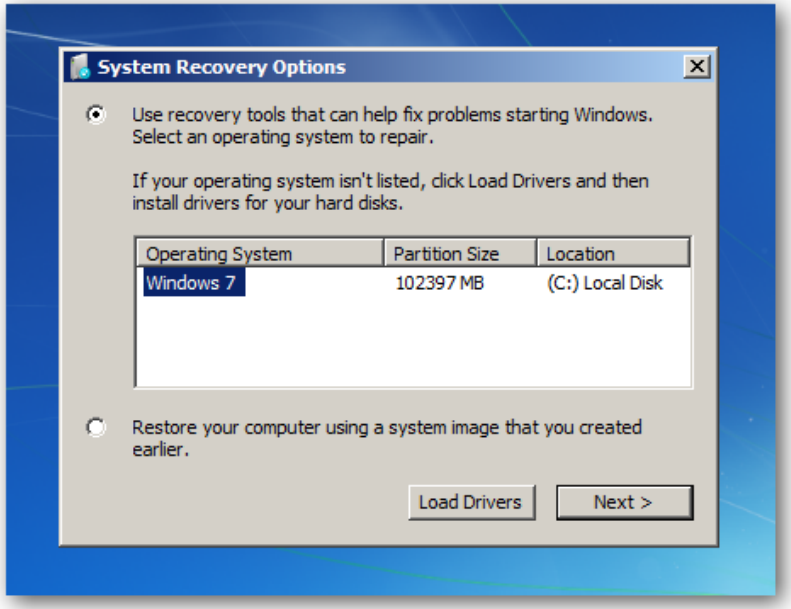
- syslogs:
  - /var/log/syslog, `dmesg`, `journalctl`
- logs of systemd services
  - e.g. Mediatomb: /var/log/mediatomb
- Live demo: Checking on my router at home



TheAlternative.ch
for a sustainable digital world

chroot

- repairing a broken GRUB
- vs. magic Windows / Mac Boot fix



i.stack.imgur.com

TheAlternative.ch
for a sustainable digital world

chroot

- “starting” a broken system without booting it
- Boot USB, Live mode (OpenSUSE: “Rescue System”)
- Login as root
- mount /dev/mapper/system-root (or /dev/sda1 etc.) into /mnt
- `mount -o bind /proc /mnt/proc`
- `mount -o bind /sys /mnt/sys`
- `mount -o bind /dev /mnt/dev`
- `chroot /mnt`
- You now have a root shell on your usual system

TheAlternative.ch
for a sustainable digital world

cronjobs

- Periodic jobs
- Handled by the crontab table
- Schedule for weekday / time / …
- Schedule for reboot

- `crontab -e`

TheAlternative.ch
for a sustainable digital world

Easy development

- Tight system integration
  - gcc, gdb – live demo of gcc
  - java, ghc, python, ruby etc.
- PM brings in all you need
  - e.g. Library “eigen3”
  - powerful editors, e.g. qtcreator, atom, vim, eclipse, codeblocks
- vs. MinGW etc.

Encrypt

- LUKS: encrypt an entire partition
  - First erase whole disk (e.g. `dd if=/dev/zero...`)
  - `cryptsetup luksFormat /dev/sd...`
  - `cryptsetup luksOpen /dev/sd...`
- encfs: create an encrypted folder
  - No need to be root
  - `encfs ~/.../targetDir ~/.../decryptedDirMount`
  - `fusermount -u ~/.../decryptedDirMount`
  - Live demo!

What have we seen?

- In just 3 courses, you have learned the basics of a system that is so universal that it can run on your computer, your NAS, your router and many more
- This means you now have the skills to rule all these devices! But careful: You are not yet experienced... security!
- You're now ready to read yourself as smart as you want to be, we will assist you if you run into any trouble
- Anything can be automatized, your time and motivation are the only limits

Helpful resources

- Arch Linux Wiki
- ubuntuusers.de
- man pages
- Stack Overflow
- TheAlternative.ch !

Coming up

- Bash workshop (“sold” out)
  - 21.10.16 | 17:15-19:00 | ETH HG E 41
  - 24.10.16 | 17:15-19:00 | ETH HG E 22

- “The Developer's Toolkit or Things I Wish I'd Known Earlier”
  - 25.10.16 | 17:15-19:00 | ETH HG D 5.2
  - This semester's spotlight course

- Stammtische: Community meetings in a casual setting (i.e. beer!)

Like this stuff? Become part of our community

- Stammtische every 2 weeks
  - talk about your ideas, get inspired
- A great team
  - we make the LinuxDays happen twice a year
  - over 200 people involved
  - great networking opportunity
  - we have many friends in the ETH / UZH staff
- Help at our install events
  - every year, we set up Linux on over 300 machines
  - many challenges, brand new machines and rare hardware
  - acquire practical skills