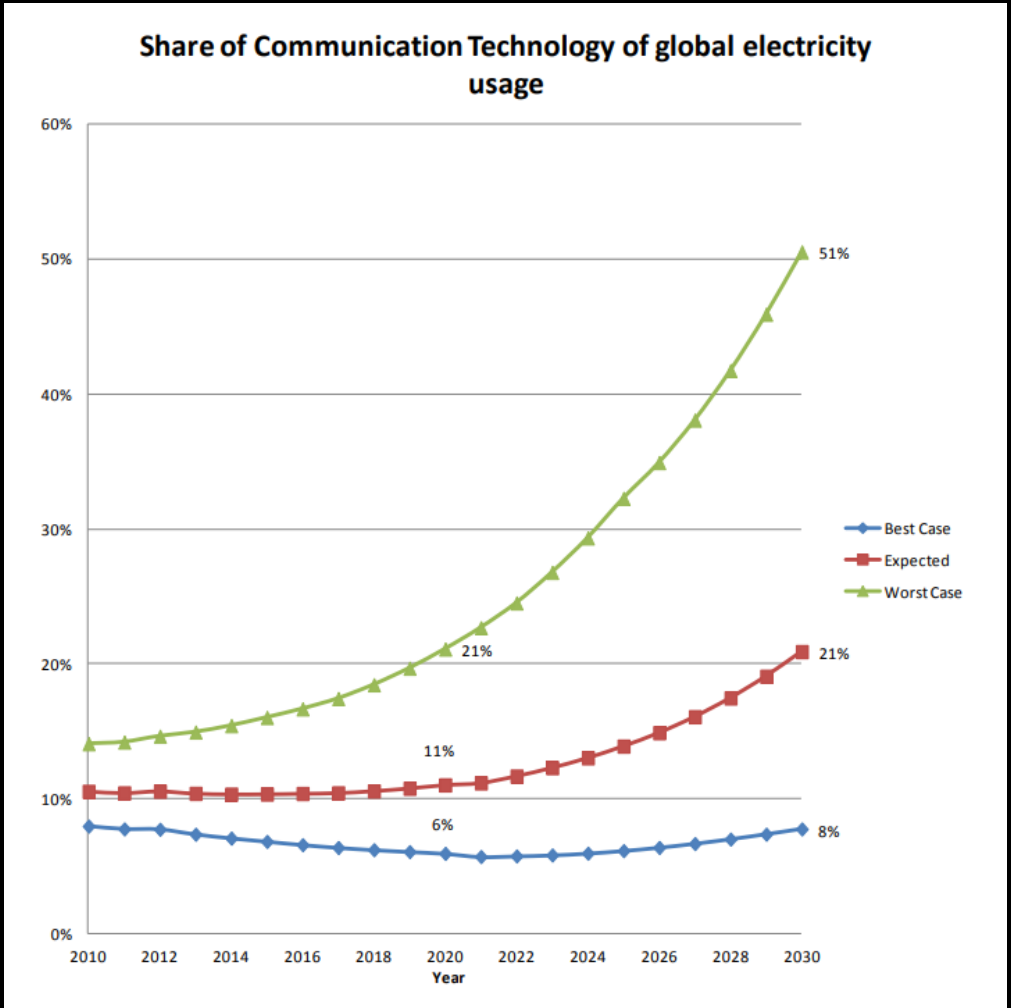
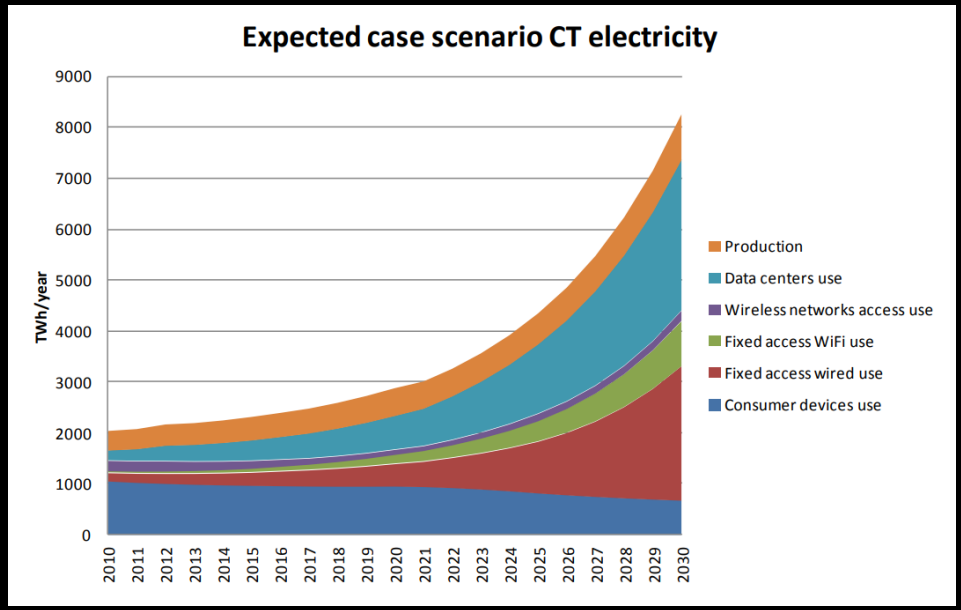
Towards sustainable computing

How KDE can help to get there

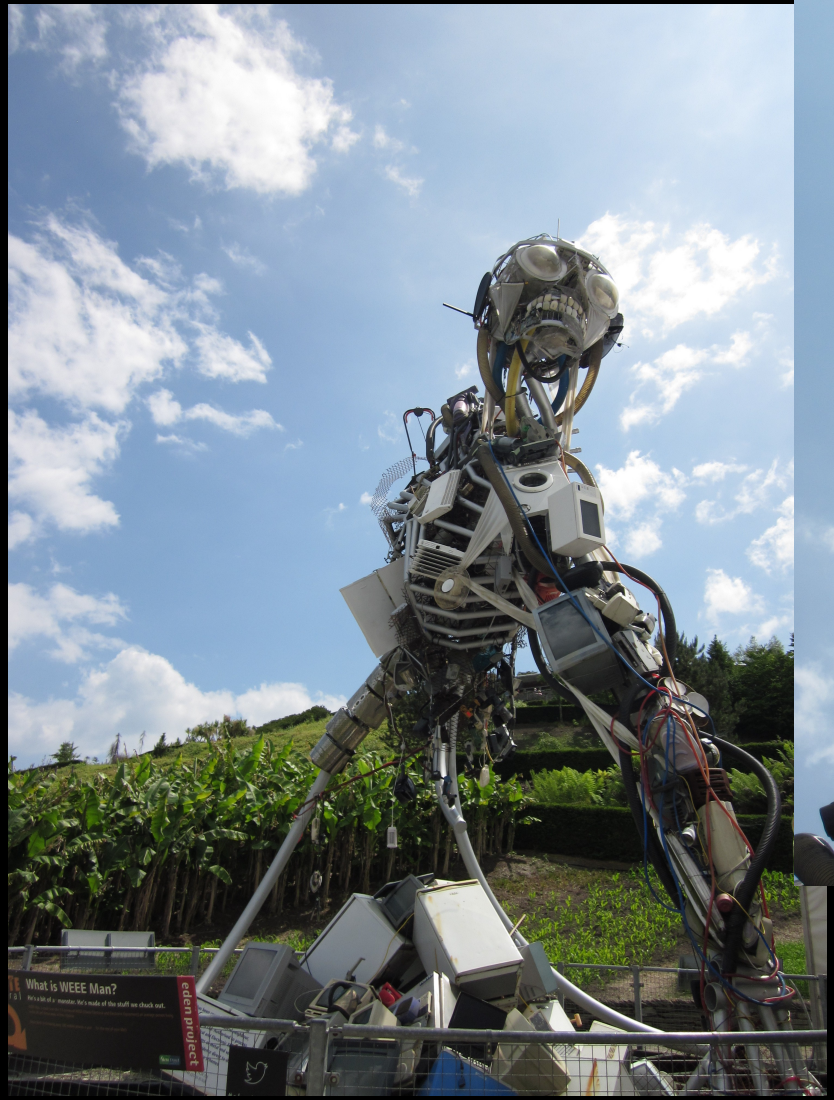
Akademy 2021

Cornelius Schumacher <schumacher@kde.org>

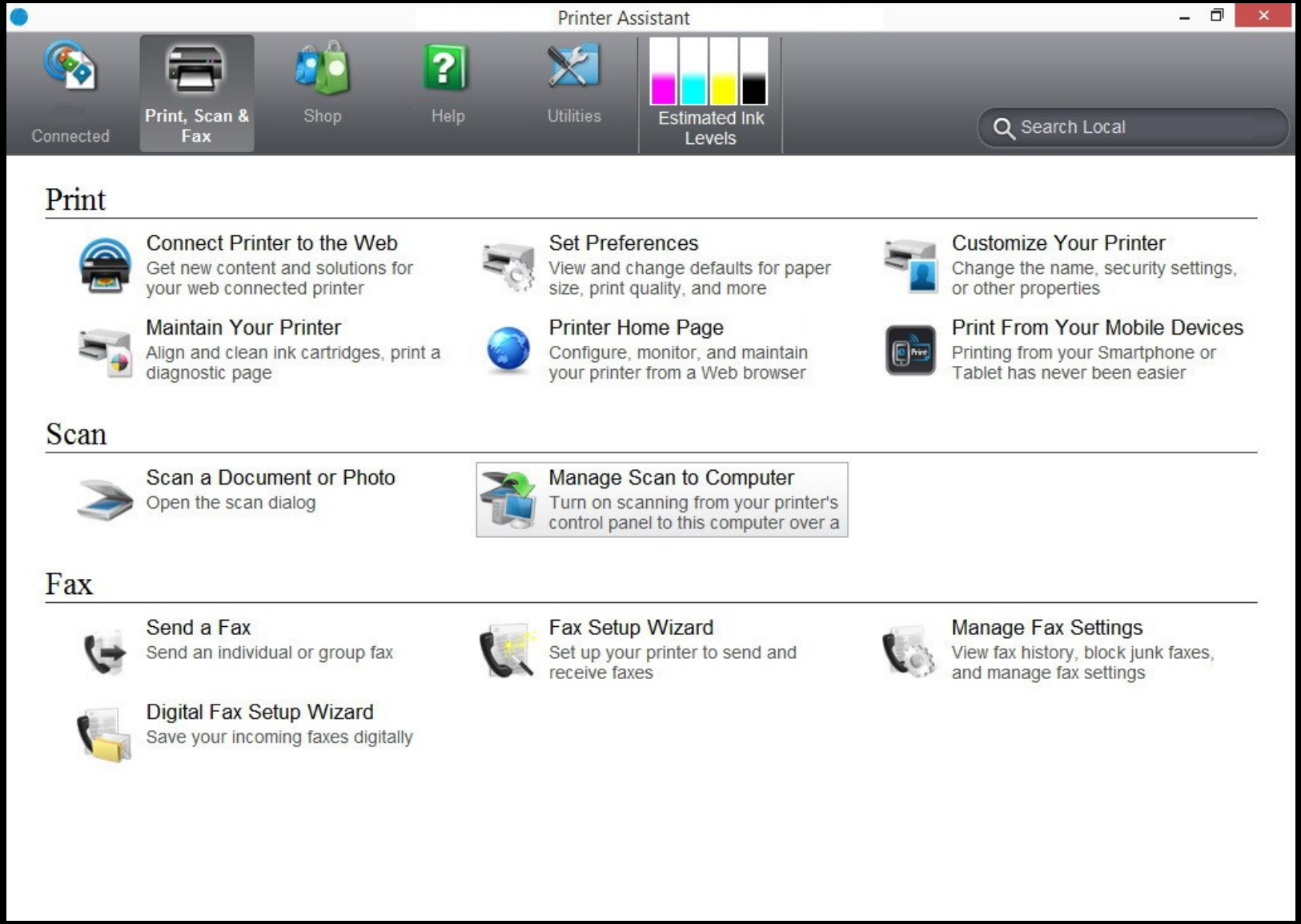


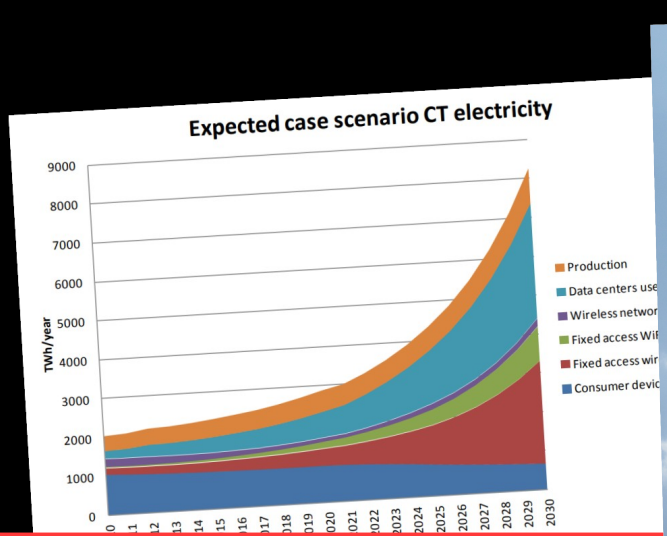


From: Anders S. G. Andrae and Tomas Edler,
On Global Electricity Usage of Communication Technology: Trends to 2030



The WEEE Man


Printer Assistant
Connected
Print, Scan & Fax
Shop
Help
Utilities
Estimated Ink Levels
Search Local
Print
Connect Printer to the Web
Get new content and solutions for your web connected printer
Set Preferences
View and change defaults for paper size, print quality, and more
Customize Your Printer
Change the name, security settings, or other properties
Maintain Your Printer
Align and clean ink cartridges, print a diagnostic page
Printer Home Page
Configure, monitor, and maintain your printer from a Web browser
Print From Your Mobile Devices
Printing from your Smartphone or Tablet has never been easier
Scan
Scan a Document or Photo
Open the scan dialog
Manage Scan to Computer
Turn on scanning from your printer's control panel to this computer over a
Fax
Send a Fax
Send an individual or group fax
Fax Setup Wizard
Set up your printer to send and receive faxes
Manage Fax Settings
View fax history, block junk faxes, and manage fax settings
Digital Fax Setup Wizard
Save your incoming faxes digitally



Can we do something about this?


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

What‘s the role of **software**?

Hardware and software can‘t be separated

Architecture and design of software determines energy consumption

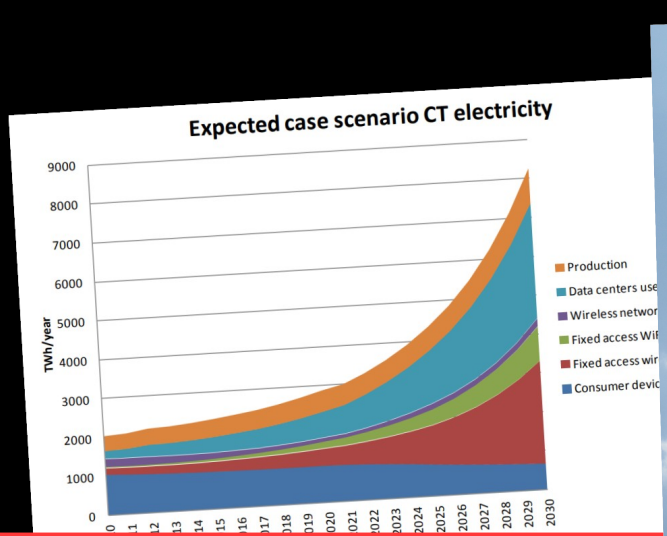
Hardware becomes obsolete because of software

Restrictions are implemented in software

What‘s the role of **software**?

Software matters

It matters **how** software is done



What can we do about this?

KDE‘s vision:

**"A world in which
everyone has control over their digital life
and enjoys freedom and privacy."**

https://community.kde.org/KDE/Vision

KDE technology is efficient

Native applications

C++ is a resource efficient programming language

Linux as open and efficient platform

Total

	Energy
(c) C	1.00
(c) Rust	1.03
(c) C++	1.34
(c) Ada	1.70
(v) Java	1.98
(c) Pascal	2.14
(c) Chapel	2.18
(v) Lisp	2.27
(c) Ocaml	2.40
(c) Fortran	2.52
(c) Swift	2.79
(c) Haskell	3.10
(v) C#	3.14
(c) Go	3.23
(i) Dart	3.83
(v) F#	4.13
(i) JavaScript	4.45
(v) Racket	7.91
(i) TypeScript	21.50
(i) Hack	24.02
(i) PHP	29.30
(v) Erlang	42.23
(i) Lua	45.98
(i) Jruby	46.54
(i) Ruby	69.91
(i) Python	75.88
(i) Perl	79.58

	Time
(c) C	1.00
(c) Rust	1.04
(c) C++	1.56
(c) Ada	1.85
(v) Java	1.89
(c) Chapel	2.14
(c) Go	2.83
(c) Pascal	3.02
(c) Ocaml	3.09
(v) C#	3.14
(v) Lisp	3.40
(c) Haskell	3.55
(c) Swift	4.20
(c) Fortran	4.20
(v) F#	6.30
(i) JavaScript	6.52
(i) Dart	6.67
(v) Racket	11.27
(i) Hack	26.99
(i) PHP	27.64
(v) Erlang	36.71
(i) Jruby	43.44
(i) TypeScript	46.20
(i) Ruby	59.34
(i) Perl	65.79
(i) Python	71.90
(i) Lua	82.91

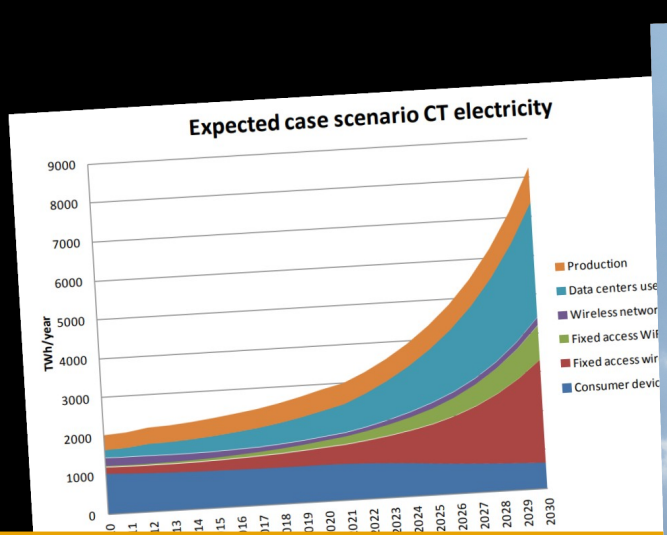
	Mb
(c) Pascal	1.00
(c) Go	1.05
(c) C	1.17
(c) Fortran	1.24
(c) C++	1.34
(c) Ada	1.47
(c) Rust	1.54
(v) Lisp	1.92
(c) Haskell	2.45
(i) PHP	2.57
(c) Swift	2.71
(i) Python	2.80
(c) Ocaml	2.82
(v) C#	2.85
(i) Hack	3.34
(v) Racket	3.52
(i) Ruby	3.97
(c) Chapel	4.00
(v) F#	4.25
(i) JavaScript	4.59
(i) TypeScript	4.69
(v) Java	6.01
(i) Perl	6.62
(i) Lua	6.72
(v) Erlang	7.20
(i) Dart	8.64
(i) Jruby	19.84

From: Rui Pereira, Marco Couto, Francisco Ribeiro, Rui Rua, Jácome Cunha, João Paulo Fernandes, and João Saraiva. 2017.
Energy Efficiency across Programming Languages: How Do Energy, Time, and Memory Relate?

KDE provides leverage

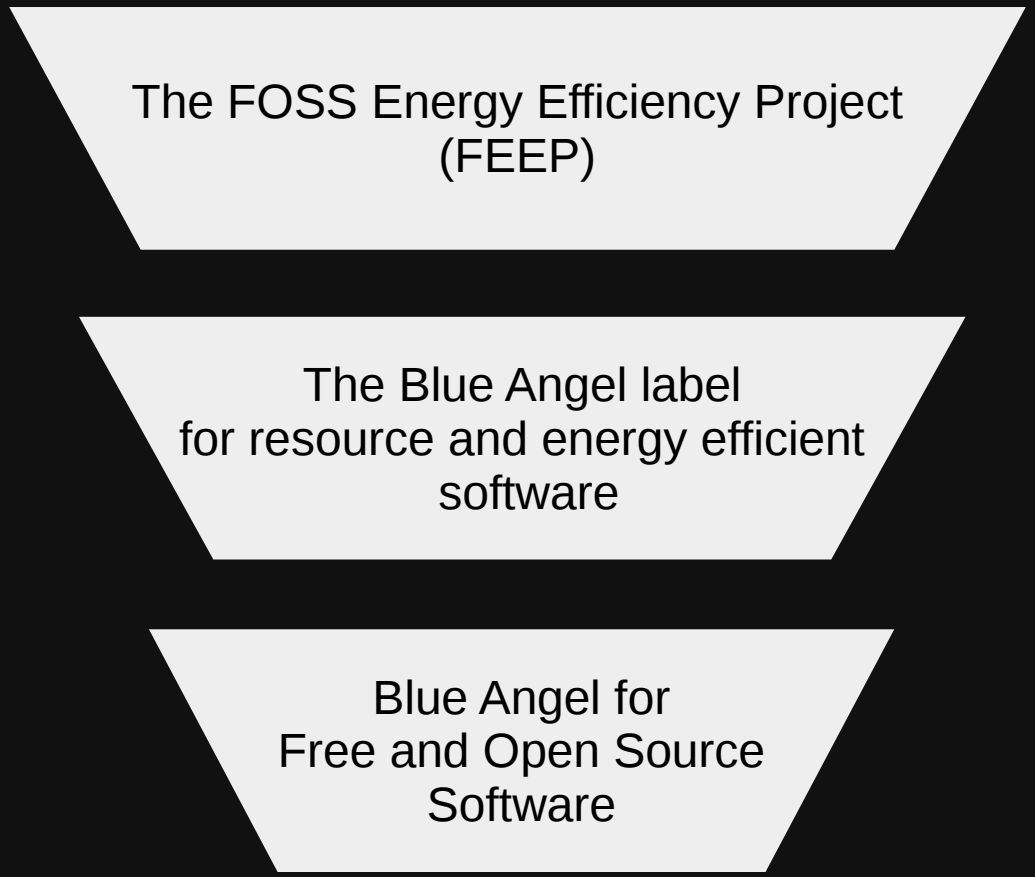
Many applications
Many use cases
Many users

Even small effects
accumulate and propagate



How do we do it?

Three projects



Measurments
Quantify energy efficiency

Certification
Demonstrate sustainability criteria

Community
Spread the word, engage others

FEEP

The FOSS Energy Efficiency Project (FEEP)

Goals:

Quantify energy efficiency

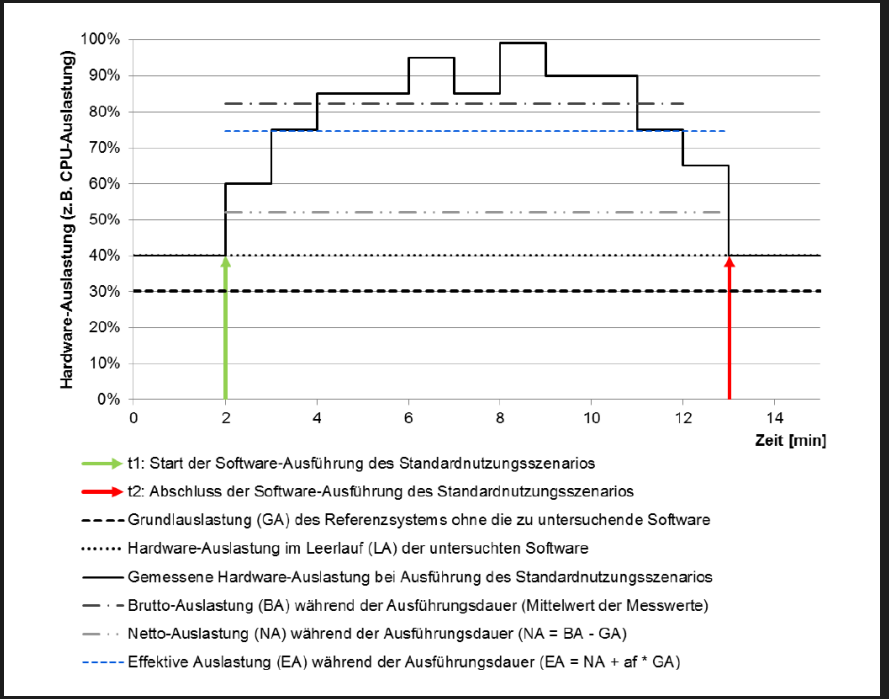
Make measurements **repeatable**

Make results **transparent**

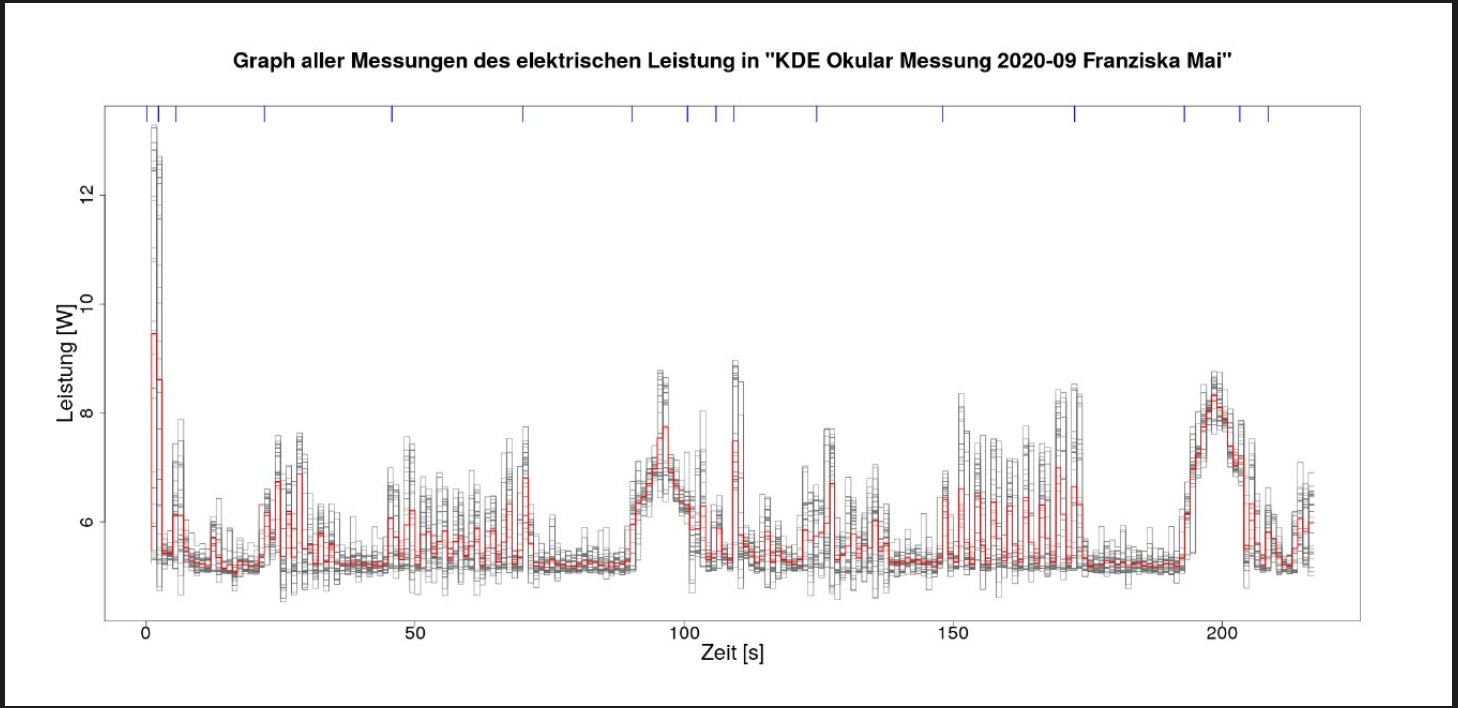
Automate measurements

Measurement procedure

- Based on UFOPLAN-SSD 2015 – UMWELTFORSCHUNGSPLAN: SUSTAINABLE SOFTWARE DESIGN 2015
- Focused on desktop software
- Automated usage scenarios
  - Baseline
  - Idle
  - Standard usage
- Measurement
  - Power consumption with external meter
  - Collection of system stats
- Report generation
  - Average power and resource utilisation



Measurements – Okular

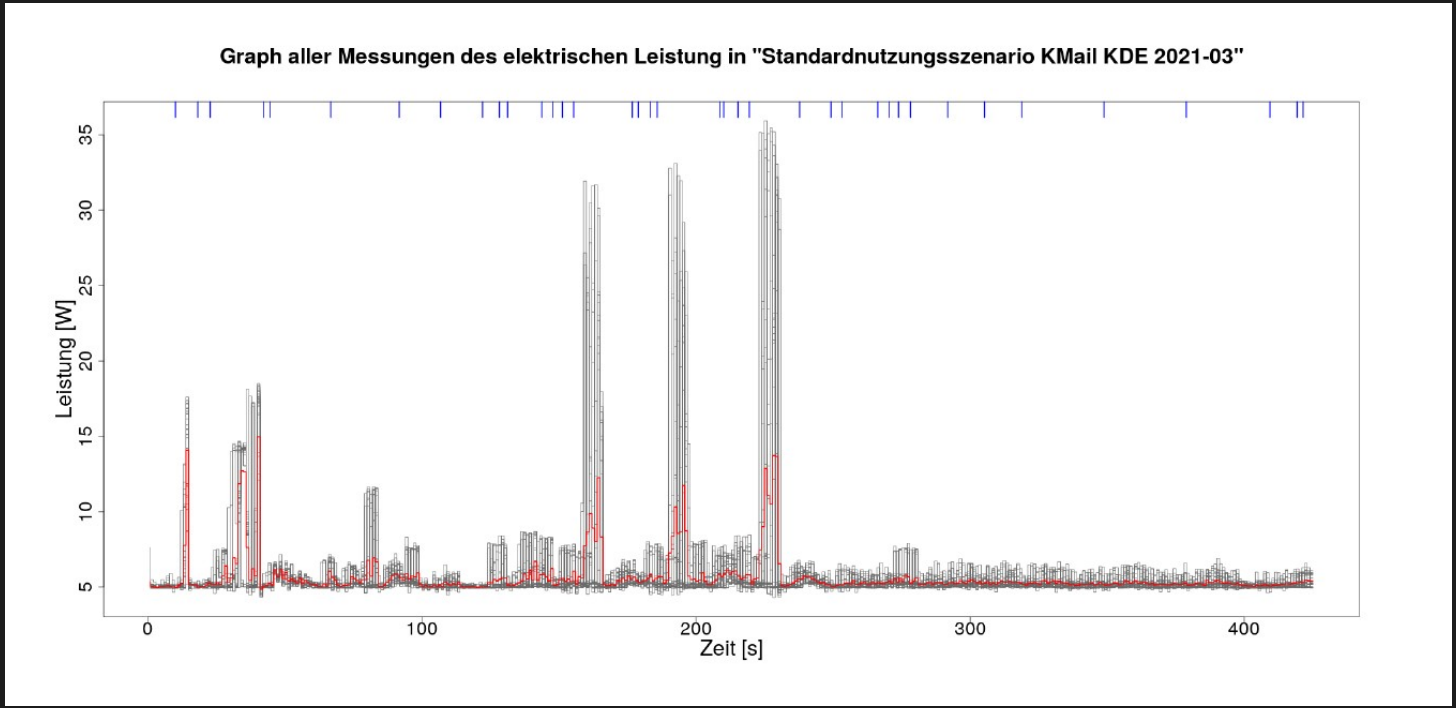


Usage scenario:

- Open file
- Presentation mode
- Change pages
- Invert view
- Zoom
- Change pages
- Invert view

Measurements done by Franziska Mai at Umwelt-Campus Birkenfeld

Measurements – KMail

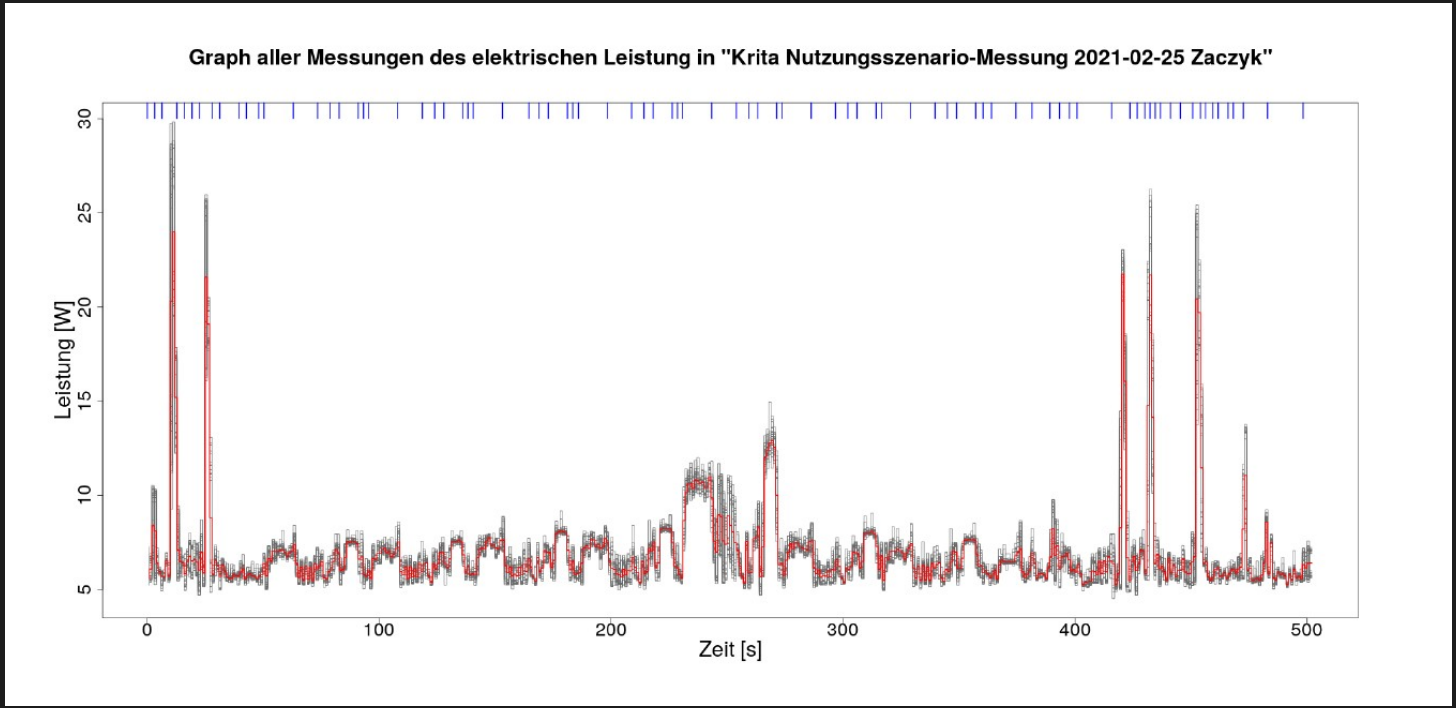


Usage scenario:

- Open mail folders
- Compose and send mail
- Read mails
- Reply to 3 mails
- Organize and move mails

Measurements done by Ina Seiwert at Umwelt-Campus Birkenfeld

Measurements – Krita

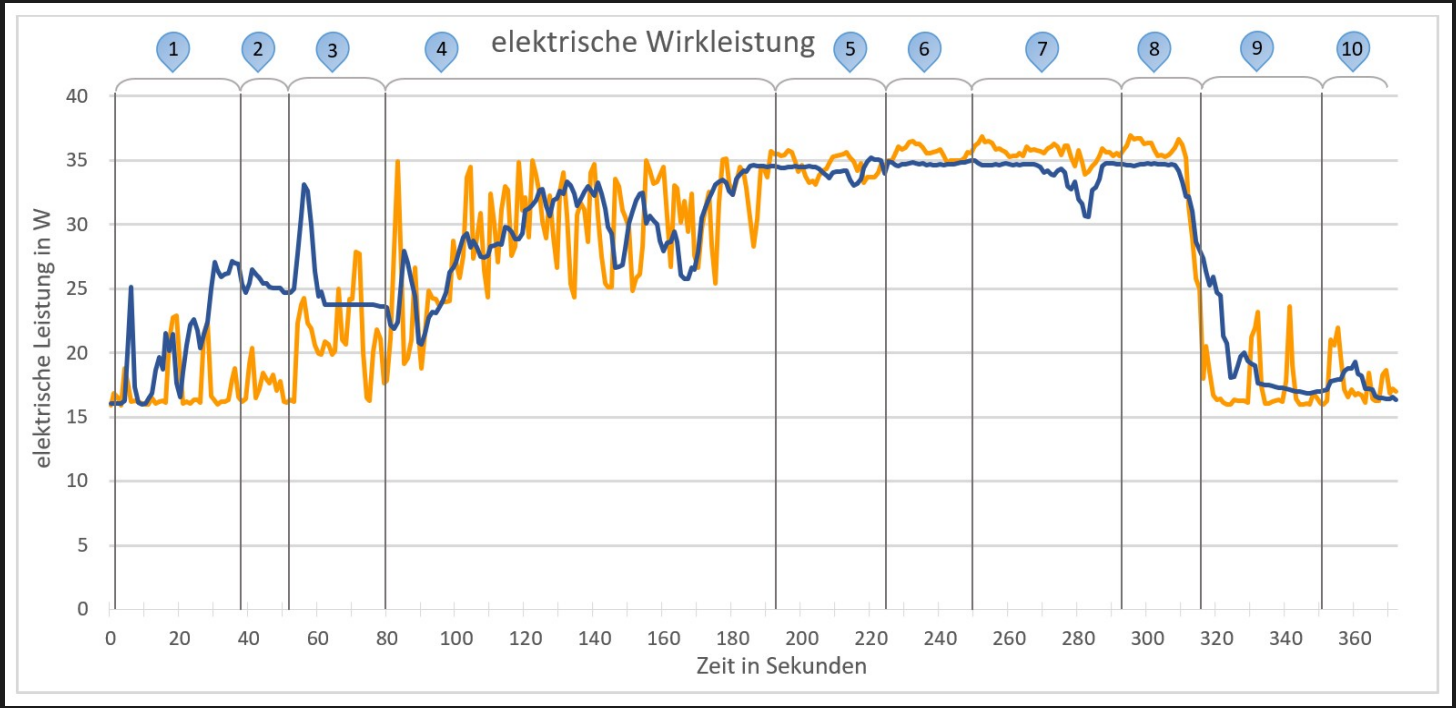


Usage scenario:

- Open picture
- Move layer to group
- Move layer to other layer
- Delete group
- Create group from selected layers

Measurements done by Melissa Zaczyk at Umwelt-Campus Birkenfeld

Measurements – Operating systems



yellow: Linux
blue: Windows

Usage scenario:
1) Install software
2) Create folder
3) Run Spotify
4) Download in browser
5) Copy from USB
6) Run VLC
7) Create test files
8) Delete folder
9) Uninstall software
10) Empty cache

Measurements done by Franziska Mai at Umwelt-Campus Birkenfeld

What if this would be part of our CI?

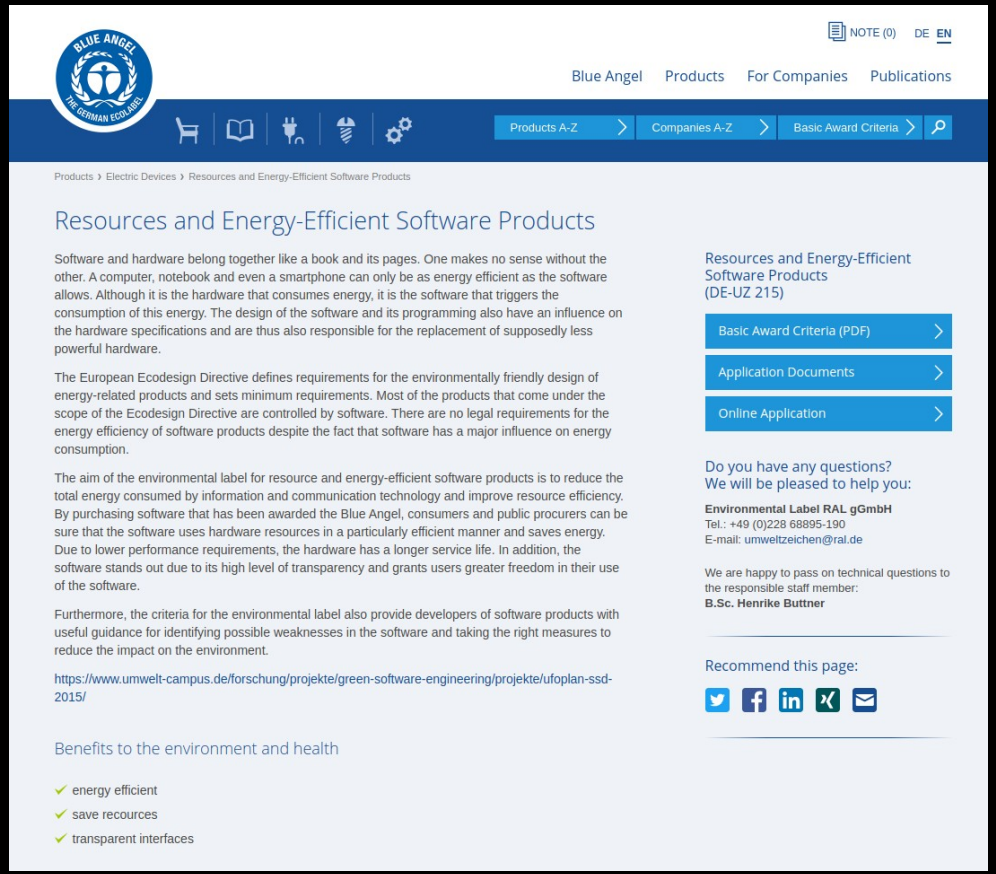
- We already have quality gates and metrics for releases
  - Passing tests
  - Bug count
  - Translations
  - ...
- What if we would make energy efficiency another quality gate?
  - Spot regressions
  - Motivate optimisation
  - Transparency, enabling users to choose

Blue Angel

„The Blue Angel is the ecolabel of the federal government of Germany since 1978. The Blue Angel sets high standards for environmentally friendly product design and has proven itself over the past 40 years as a reliable guide for a more sustainable consumption.“

https://www.blauer-engel.de/en

Resource and energy efficient software



New category introduced in 2020

Presentation at 36C3 by Marina Köhn and Eva Kern:
„Wie klimafreundlich ist Software?“
(„How climate friendly is software“, English translation available)

Current focus: desktop applications
Server and mobile will be added

Criteria:

- Resource and energy-efficiency
- Potential hardware operating life
- User autonomy

https://www.blauer-engel.de/en/products/electric-devices/resources-and-energy-efficient-software-products

Criteria: Resource and energy-efficiency

- Measurements according to UFOPLAN-SSD methodology for standard usage scenarios
- Transparency of measurements (publication in standard format)

Criteria: Potential hardware operating life

- Energy consumption should not increase with new versions
- Measurements on old reference systems (spec for 2015-2019 systems)


Microsoft
Microsoft

Criteria: User autonomy

- Data formats
- Transparency of the software product
- Continuity of the software product
- Uninstallability
- Offline capability
- Modularity
- Freedom from advertising
- Documentation of the software product, licence conditions and terms of use

ENGLISH

Do-FOSS
Wettbewerb braucht Freie Software

STARTSEITE FREIE SOFTWARE ÜBER DO-FOSS RECHTLICHES

GREEN-IT: STADT DORTMUND BEKENNT SICH ZUM BLAUEN ENGEL FÜR RESSOURCEN- UND ENERGIEEFFIZIENTE SOFTWAREPRODUKTE

07.06.2021 VON TILL SCHÄFER

Freie Software für Digitale Nachhaltigkeit

In ihrem Sachstandsbericht Green IT bei der Stadt Dortmund vom 11.03.2021 bekennt sich die Stadt Dortmund zum Blauen Engel für Ressourcen- und energieeffiziente Softwareprodukte. Getragen wird das Umweltzeichen des Blauen Engels vom Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit, dem Umweltbundesamt, der Jury Umweltzeichen und der Ral gGmbH. Der Blaue Engel fordert Eigenschaften von mit dem Gütesiegel ausgezeichneter Software, welche Kriterien von Freier Software aufgreifen. Dies Betrifft u.a. die Offenlegung des Quellcodes und die damit einhergehende Transparenz des Softwareprodukts, Offene Standards, Nutzungsautonomie und die Ausreizung der potenziellen Hardware-Nutzungsdauer. Durch das Umweltzeichen des Blauen Engels wird deutlich: Der Schlüssel zur Erhöhung der Energieeffizienz und Schonung natürlicher Ressourcen liegt nicht nur in der Hardware, sondern insbesondere in der Software. Diese Erkenntnis institutionalisiert sich in der Dortmunder Verwaltung über den

Logo: Blauer Engel (© MBU)

SUCHEN

Search …

FOLGEN

KAMPAGNEN

Public Money
Public Code

Green IT: City of Dortmund commits to Blue Angel for resource and energy efficient software

Source: blog.do-foss.de

Where are we?

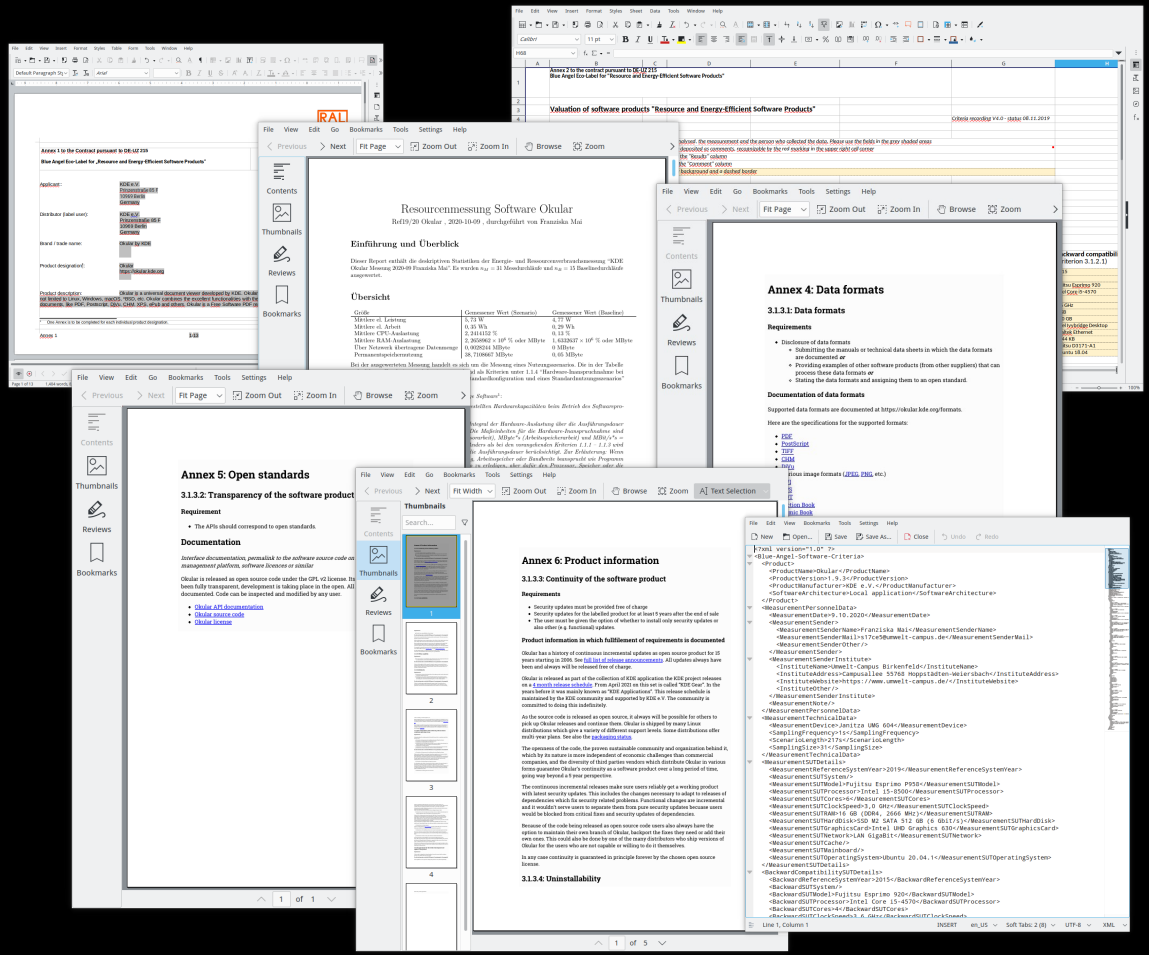
Application for Okular is almost ready.

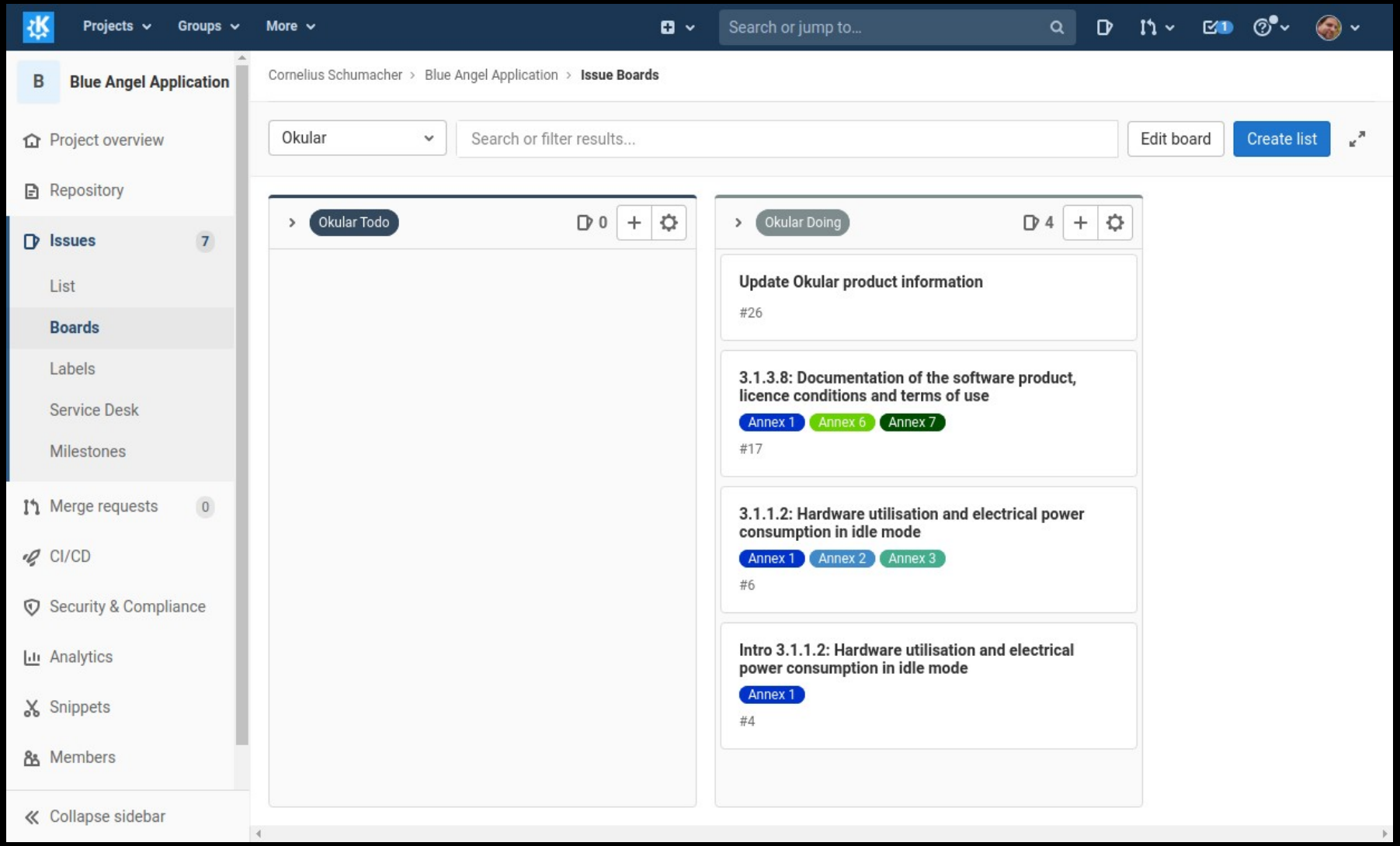
KMail, Krita next.
Measurements available.

Measurements to be done for more applications:
KDevelop, Kate, ...

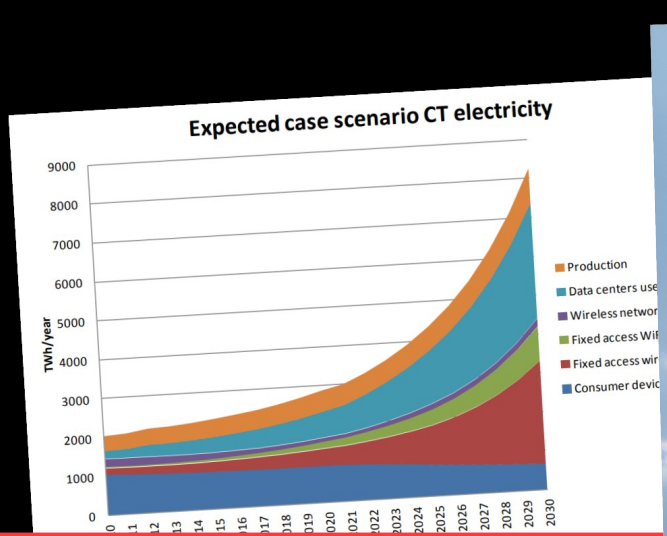
Tooling and infrastructure available to help with the measurements and applications.

KDE e.V. as official applicant





https://invent.kde.org/cschumac/blue-angel-application/-/boards/5189



Can we do something about this?

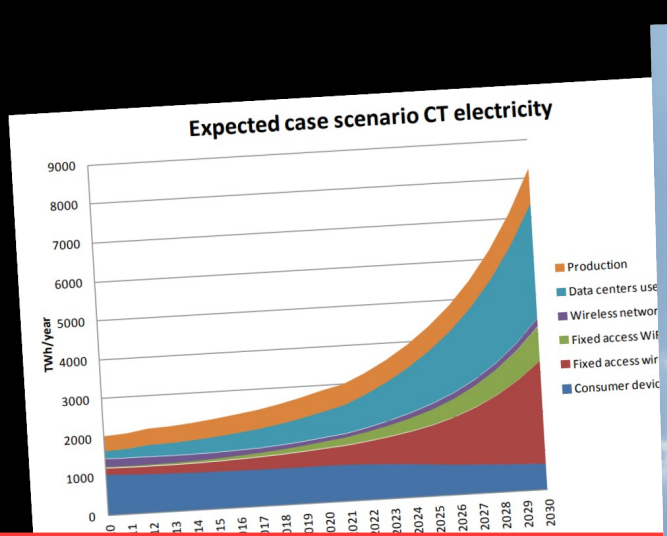
Yes, ...

... if we can shave off a bit of energy, multiply by our users

... if we can make this spread amongst other applications

... if we can make the idea stick

Blue Angel for FOSS



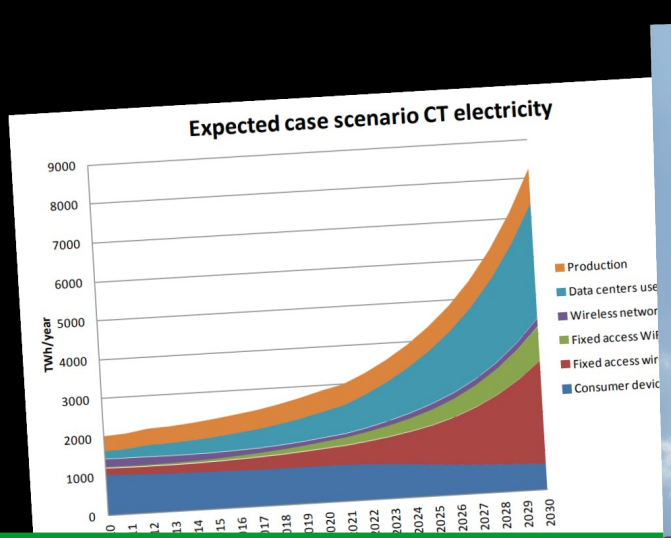
Can we do something about this?

We are not alone

Project ***„Support sustainable software development by promotion and application of the criteria of the Blue Angel in the Free and Open Source software community“*** supported by a grant of the German Environment Agency, starting in July

Contact with other organizations: FSFE, Round Table Repair, TDF

There are many more communities which might want to join



Let‘s do something about this!

Towards sustainable computing

Let‘s carry the flag for sustainable computing

Measure **energy efficiency**

Make energy efficiency a **quality gate** of our release process

Demonstrate how our software **extends hardware life**

Demonstrate how our software **preserves user autonomy**

Get **Blue Angel** for KDE applications

Spread the word, **help others**

Help wanted!

Definition of standard usage scenarios

Automation of usage scenarios

Tooling for measurements

Execution of measurements

Analysis and reports of measurement data

Documentation of user autonomy

...

Where to get together?

Mailing list:
energy-efficiency@kde.org

Repositories:
https://invent.kde.org/cschumac/feep
https://invent.kde.org/cschumac/blue-angel-application

BoF:
Tuesday, June 22nd 2021, 9:00 UTC
https://community.kde.org/Akademy/2021/Tuesday