



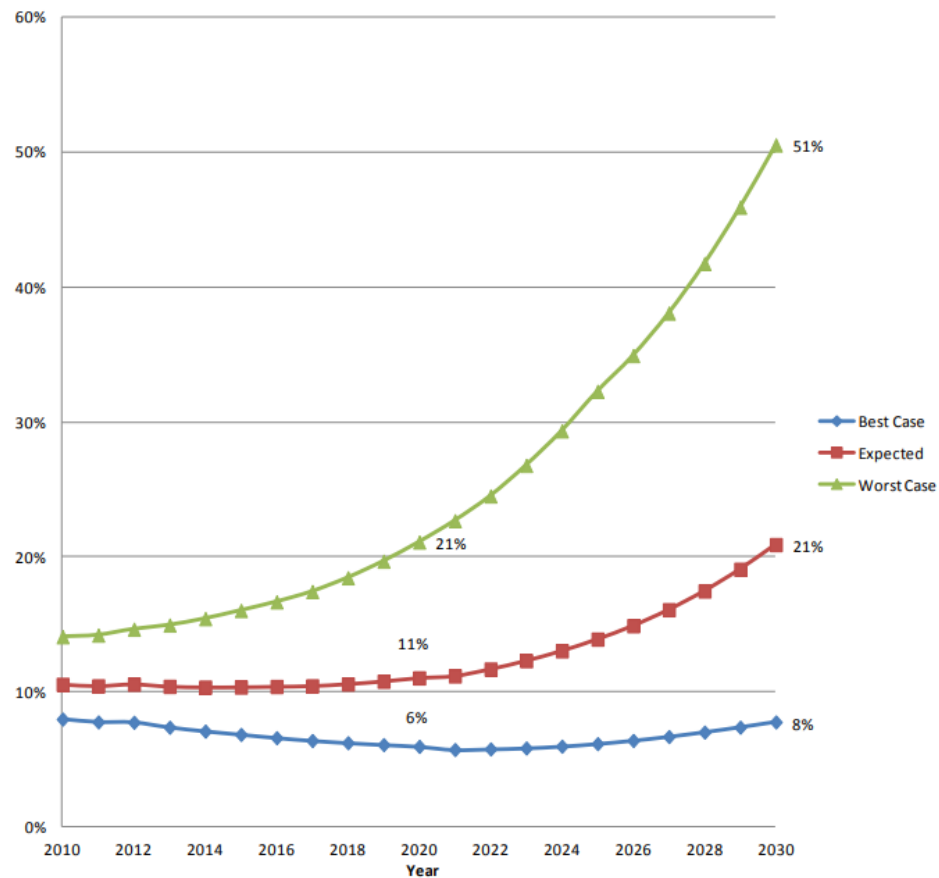
# Towards sustainable computing

How KDE can help to get there

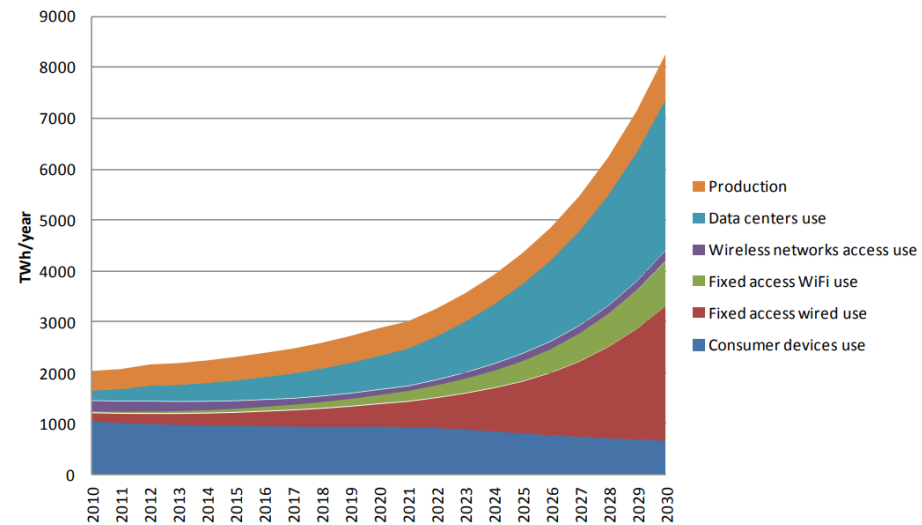
Akademy 2021

Cornelius Schumacher <[schumacher@kde.org](mailto:schumacher@kde.org)>

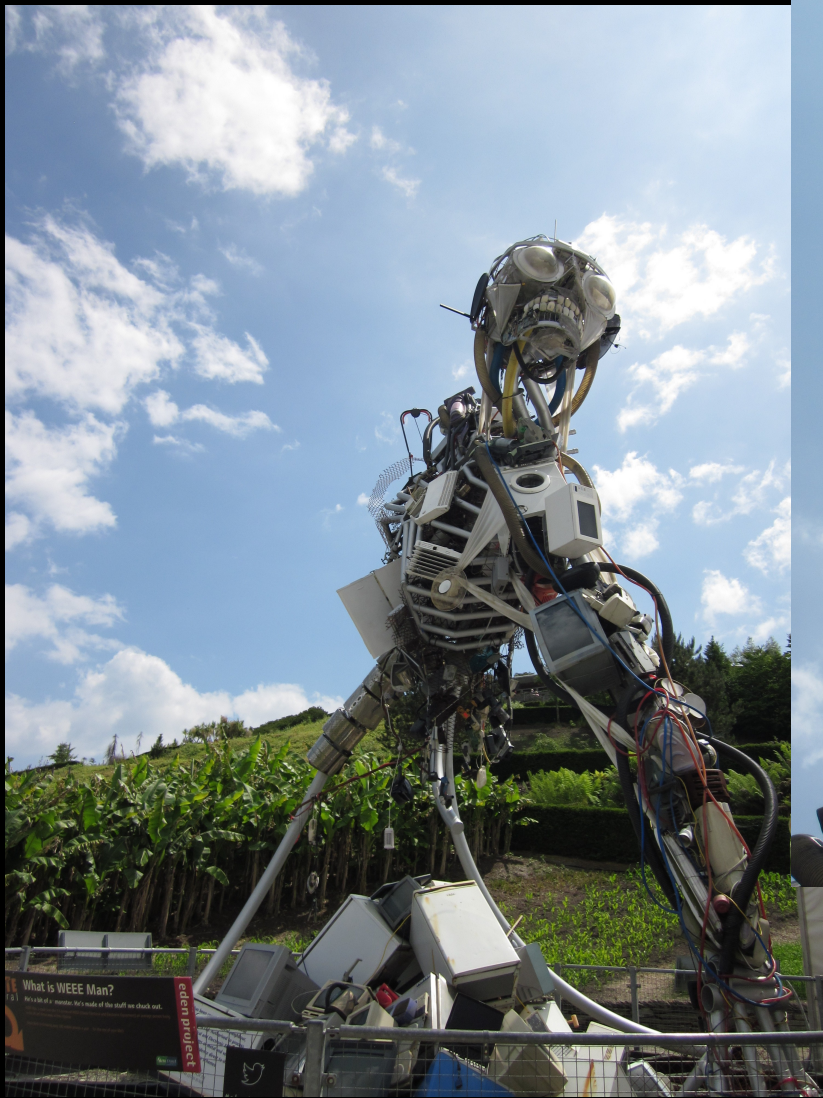
## Share of Communication Technology of global electricity usage



## Expected case scenario CT electricity



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

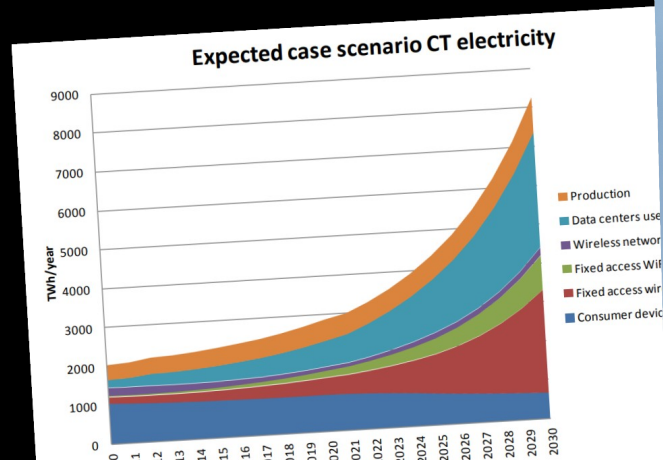
View fax history, block junk faxes, and manage fax settings



### Digital Fax Setup Wizard

Save your incoming faxes digitally





**Can we do something about this?**

# SUSTAINABLE DEVELOPMENT GOALS



# 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

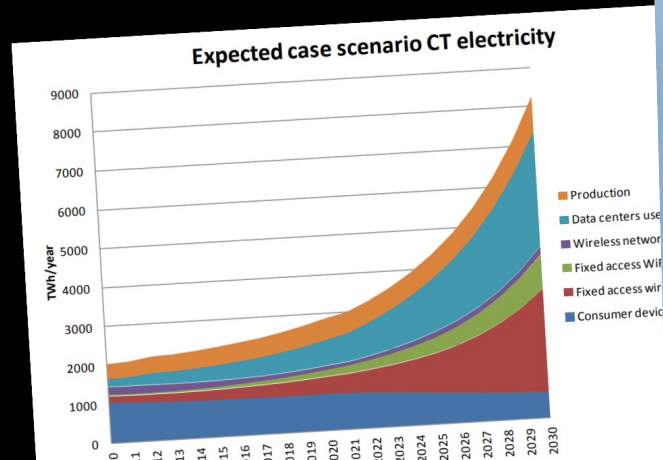
Restrictions are implemented in software

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		Time		Mb
(c) C	1.00	(c) C	1.00	(c) Pascal	1.00
(c) Rust	1.03	(c) Rust	1.04	(c) Go	1.05
(c) C++	1.34	(c) C++	1.56	(c) C	1.17
(c) Ada	1.70	(c) Ada	1.85	(c) Fortran	1.24
(v) Java	1.98	(v) Java	1.89	(c) C++	1.34
(c) Pascal	2.14	(c) Chapel	2.14	(c) Ada	1.47
(c) Chapel	2.18	(c) Go	2.83	(c) Rust	1.54
(v) Lisp	2.27	(c) Pascal	3.02	(v) Lisp	1.92
(c) Ocaml	2.40	(c) Ocaml	3.09	(c) Haskell	2.45
(c) Fortran	2.52	(v) C#	3.14	(i) PHP	2.57
(c) Swift	2.79	(v) Lisp	3.40	(c) Swift	2.71
(c) Haskell	3.10	(c) Haskell	3.55	(i) Python	2.80
(v) C#	3.14	(c) Swift	4.20	(c) Ocaml	2.82
(c) Go	3.23	(c) Fortran	4.20	(v) C#	2.85
(i) Dart	3.83	(v) F#	6.30	(i) Hack	3.34
(v) F#	4.13	(i) JavaScript	6.52	(v) Racket	3.52
(i) JavaScript	4.45	(i) Dart	6.67	(i) Ruby	3.97
(v) Racket	7.91	(v) Racket	11.27	(c) Chapel	4.00
(i) TypeScript	21.50	(i) Hack	26.99	(v) F#	4.25
(i) Hack	24.02	(i) PHP	27.64	(i) JavaScript	4.59
(i) PHP	29.30	(v) Erlang	36.71	(i) TypeScript	4.69
(v) Erlang	42.23	(i) Ruby	43.44	(v) Java	6.01
(i) Lua	45.98	(i) TypeScript	46.20	(i) Perl	6.62
(i) Jruby	46.54	(i) Ruby	59.34	(i) Lua	6.72
(i) Ruby	69.91	(i) Perl	65.79	(v) Erlang	7.20
(i) Python	75.88	(i) Python	71.90	(i) Dart	8.64
(i) Perl	79.58	(i) Lua	82.91	(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?

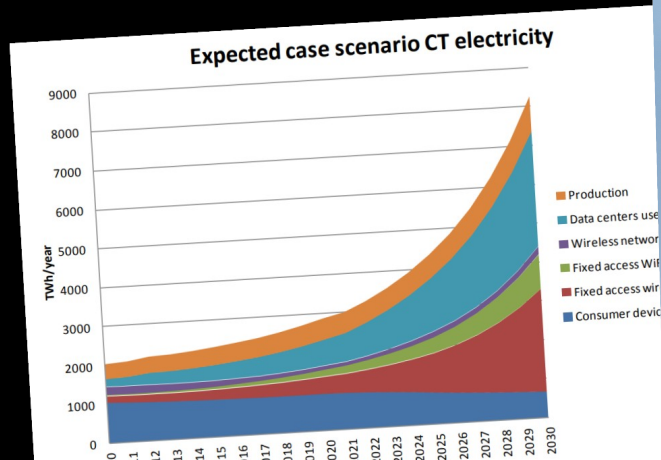
# KDE provides leverage

Many applications  
Many use cases  
Many users

Even small effects  
accumulate and propagate







# How do we do it?

# Three projects

The FOSS Energy Efficiency Project  
(FEEP)

## **Measurements**

Quantify energy efficiency

The Blue Angel label  
for resource and energy efficient  
software

## **Certification**

Demonstrate sustainability criteria

Blue Angel for  
Free and Open Source  
Software

## **Community**

Spread the word, engage others

**FEEP**

# The FOSS Energy Efficiency Project (FEEP)

Goals:

**Quantify** energy efficiency

Make measurements **repeatable**

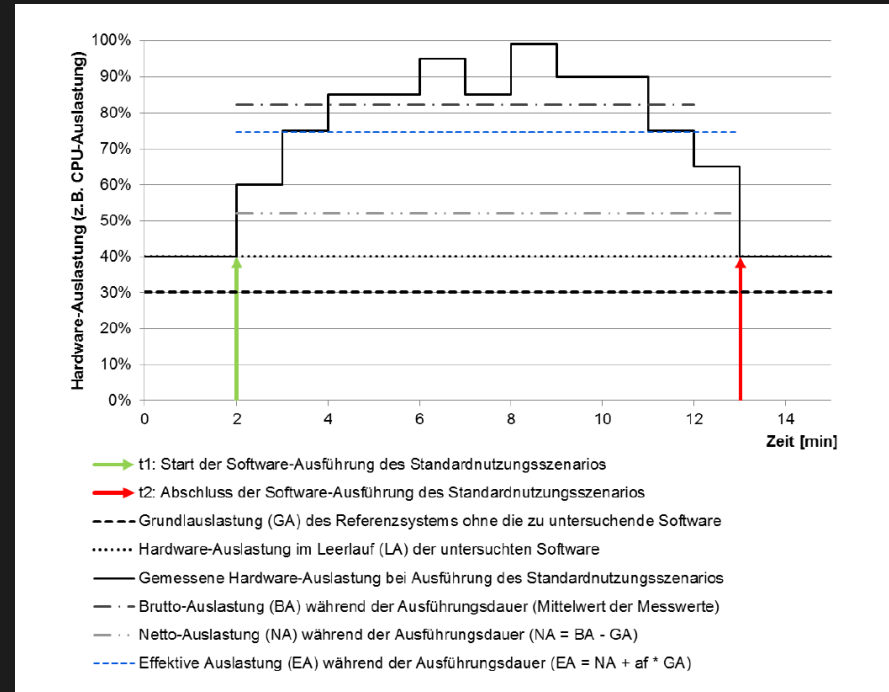
Make results **transparent**

**Automate** measurements



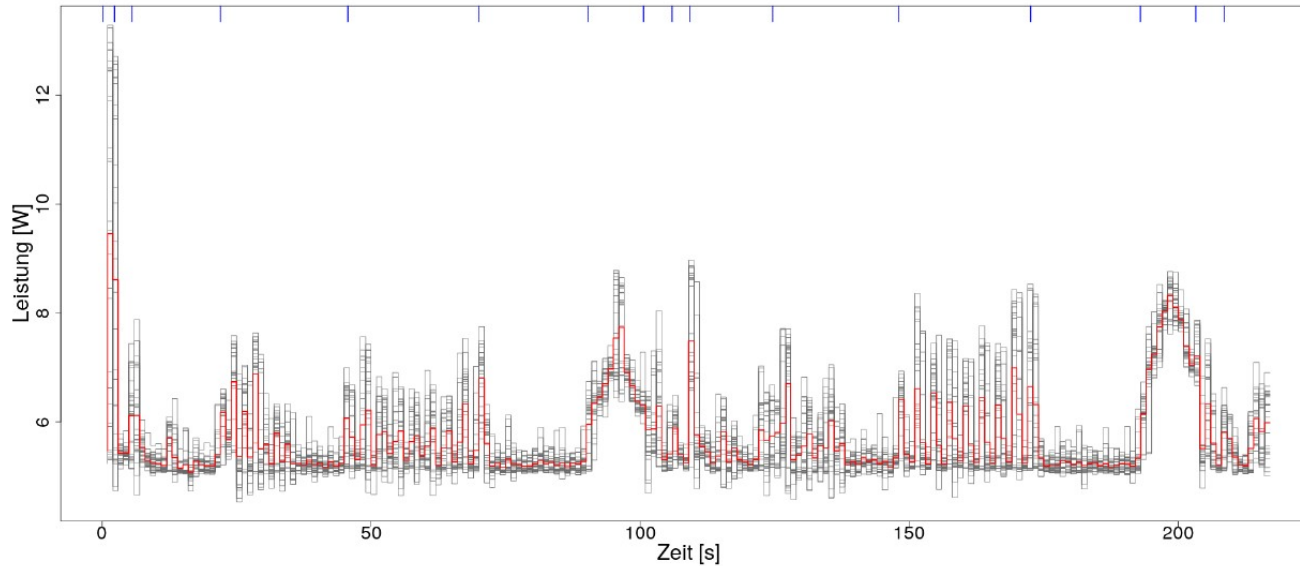
# Measurement procedure

- 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

Graph aller Messungen des elektrischen Leistung in "KDE Okular Messung 2020-09 Franziska Mai"

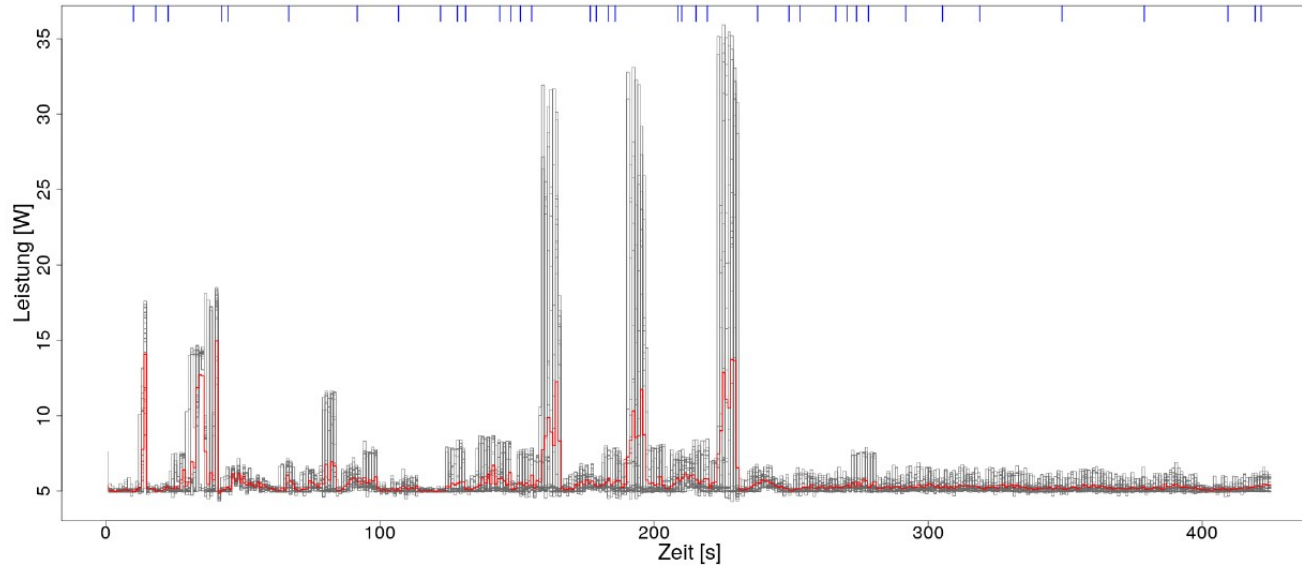


Usage scenario:

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

# Measurements – KMail

Graph aller Messungen des elektrischen Leistung in "Standardnutzungsszenario KMail KDE 2021-03"

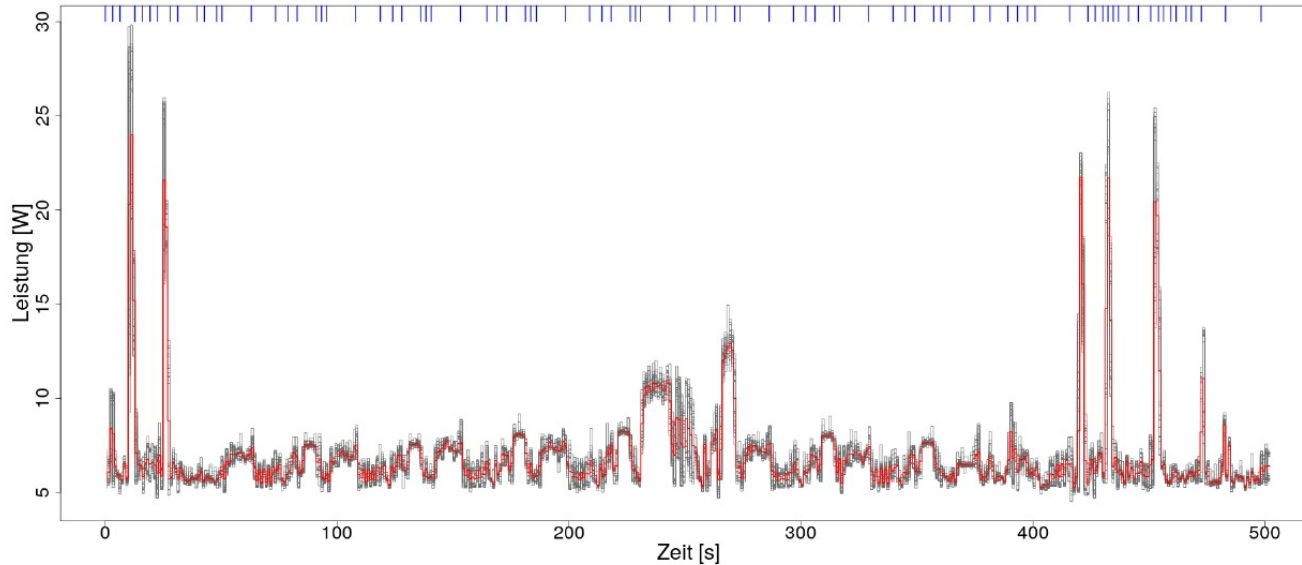


Usage scenario:

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

# Measurements – Krita

Graph aller Messungen des elektrischen Leistung in "Krita Nutzungsszenario-Messung 2021-02-25 Zaczyk"

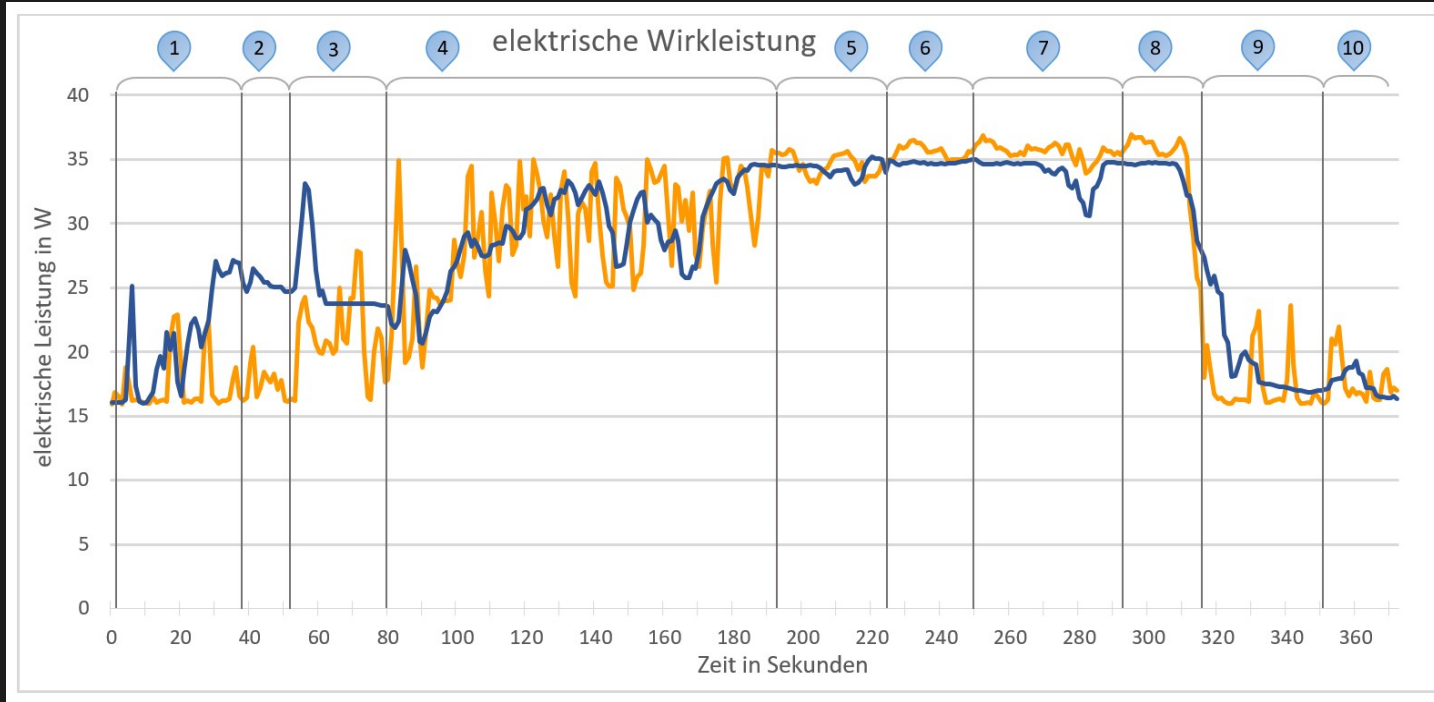


Usage scenario:

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



# 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

# 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

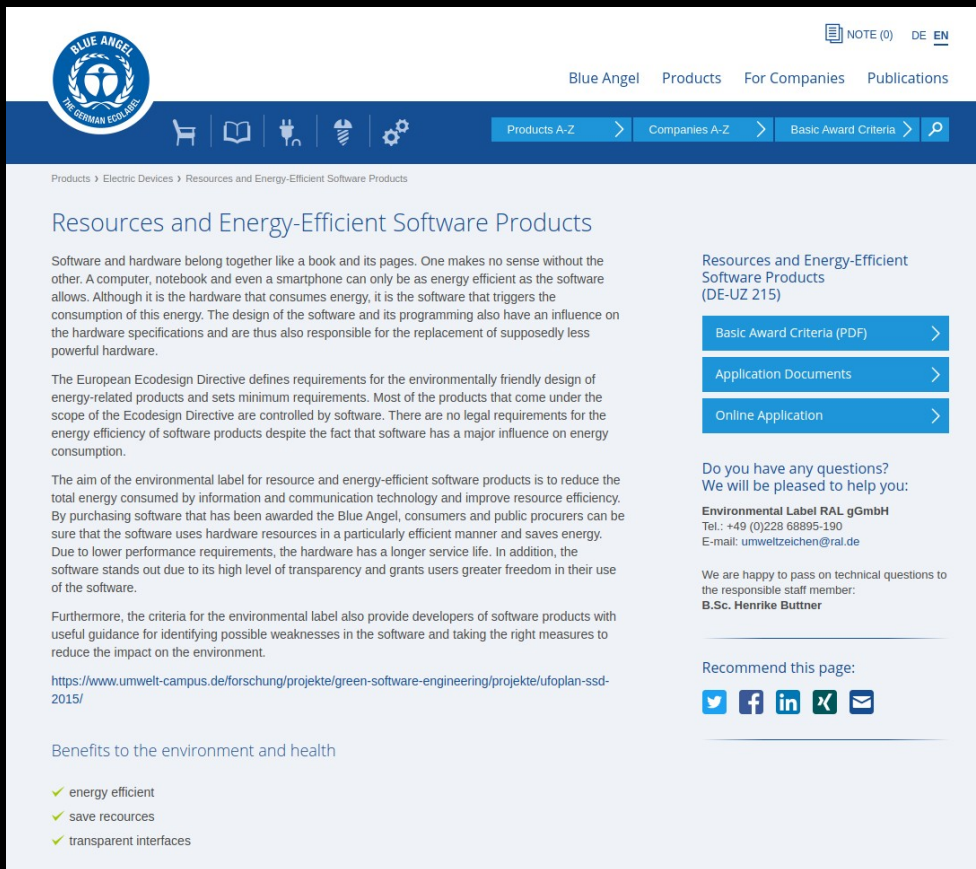
**Blue Angel**

„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



The screenshot shows the Blue Angel website. The header includes the Blue Angel logo, a navigation menu with 'Blue Angel', 'Products', 'For Companies', and 'Publications', and a language selector for 'DE' and 'EN'. Below the header is a blue navigation bar with icons for a chair, book, plug, leaf, and gear, and buttons for 'Products A-Z', 'Companies A-Z', and 'Basic Award Criteria'. The main content area is titled 'Resources and Energy-Efficient Software Products' and contains three paragraphs of text. The first paragraph explains that software and hardware belong together and that software triggers energy consumption. The second paragraph describes the European Ecodesign Directive and its requirements for software. The third paragraph states the aim of the environmental label for software products. To the right of the text are three blue buttons: 'Basic Award Criteria (PDF)', 'Application Documents', and 'Online Application'. Below these buttons is a section titled 'Do you have any questions?' with contact information for the Environmental Label RAL gGmbH. At the bottom, there is a section titled 'Benefits to the environment and health' with three green checkmarks: 'energy efficient', 'save resources', and 'transparent interfaces'.

Blue Angel  
THE GERMAN ECO LABEL

NOTE (0) DE EN

Blue Angel Products For Companies Publications

Products A-Z Companies A-Z Basic Award Criteria

Products > Electric Devices > Resources and Energy-Efficient Software Products

## Resources and Energy-Efficient Software Products

Software and hardware belong together like a book and its pages. One makes no sense without the other. A computer, notebook and even a smartphone can only be as energy efficient as the software allows. Although it is the hardware that consumes energy, it is the software that triggers the consumption of this energy. The design of the software and its programming also have an influence on the hardware specifications and are thus also responsible for the replacement of supposedly less powerful hardware.

The European Ecodesign Directive defines requirements for the environmentally friendly design of energy-related products and sets minimum requirements. Most of the products that come under the scope of the Ecodesign Directive are controlled by software. There are no legal requirements for the energy efficiency of software products despite the fact that software has a major influence on energy consumption.

The aim of the environmental label for resource and energy-efficient software products is to reduce the total energy consumed by information and communication technology and improve resource efficiency. By purchasing software that has been awarded the Blue Angel, consumers and public procurers can be sure that the software uses hardware resources in a particularly efficient manner and saves energy. Due to lower performance requirements, the hardware has a longer service life. In addition, the software stands out due to its high level of transparency and grants users greater freedom in their use of the software.

Furthermore, the criteria for the environmental label also provide developers of software products with useful guidance for identifying possible weaknesses in the software and taking the right measures to reduce the impact on the environment.

<https://www.umwelt-campus.de/forschung/projekte/green-software-engineering/projekte/ufo-plan-ssd-2015/>

### Benefits to the environment and health

- ✓ energy efficient
- ✓ save resources
- ✓ transparent interfaces

Resources and Energy-Efficient Software Products (DE-UZ 215)

Basic Award Criteria (PDF) >

Application Documents >

Online Application >

Do you have any questions?  
We will be pleased to help you:

Environmental Label RAL gGmbH  
Tel.: +49 (0)228 68895-190  
E-mail: [umweltzeichen@ral.de](mailto:umweltzeichen@ral.de)

We are happy to pass on technical questions to the responsible staff member:  
**B.Sc. Henrike Buttner**

Recommend this page:

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

## **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)



## 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







## 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 ausgezeichneten 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



SUCHEN

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](https://blog.do-foss.de)

# Where are we?

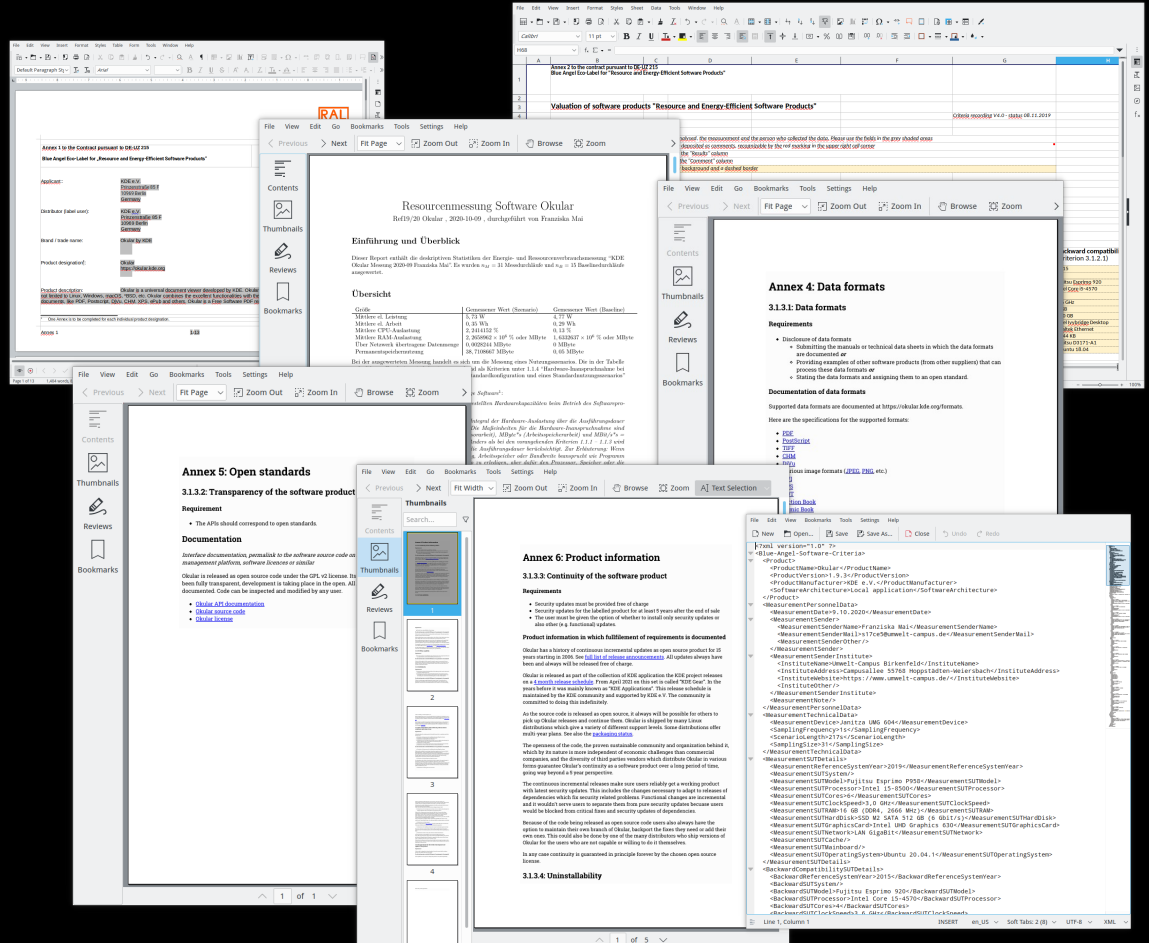
Application for Okular is almost ready.


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






Projects ▾

Groups ▾

More ▾

Search or jump to...



B

Blue Angel Application

Project overview

Repository

Issues 7

Boards

Labels

Service Desk

Milestones

Merge requests 0

CI/CD

Security & Compliance

Analytics

Snippets

Members

Collapse sidebar

Cornelius Schumacher > Blue Angel Application > Issue Boards

Okular ▾

Search or filter results...

Edit board

Create list

> Okular Todo 0

> Okular Doing 4

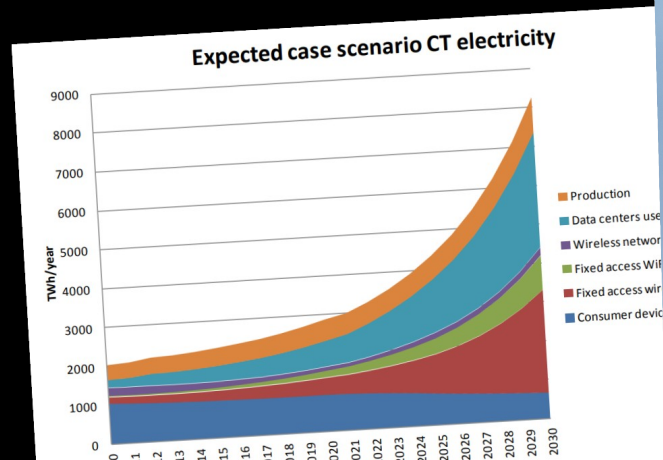
Update Okular product information  
#26

3.1.3.8: Documentation of the software product, licence conditions and terms of use  
Annex 1 Annex 6 Annex 7  
#17

3.1.1.2: Hardware utilisation and electrical power consumption in idle mode  
Annex 1 Annex 2 Annex 3  
#6

Intro 3.1.1.2: Hardware utilisation and electrical power consumption in idle mode  
Annex 1  
#4

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



**Can we do something about this?**

**Yes, ...**

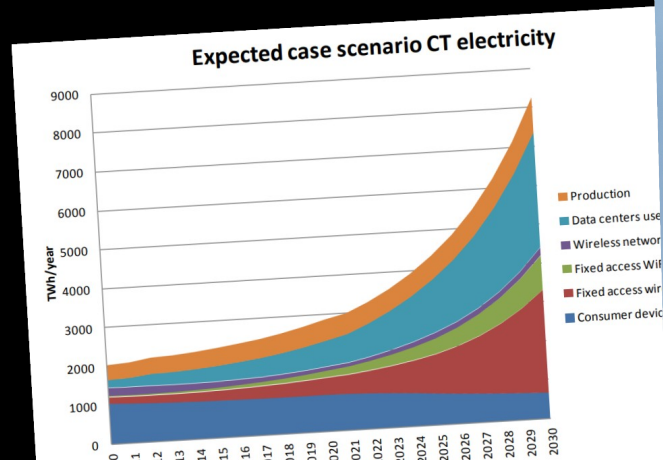
**... if we can shave off a bit of energy, multiply by our users**

**... 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?

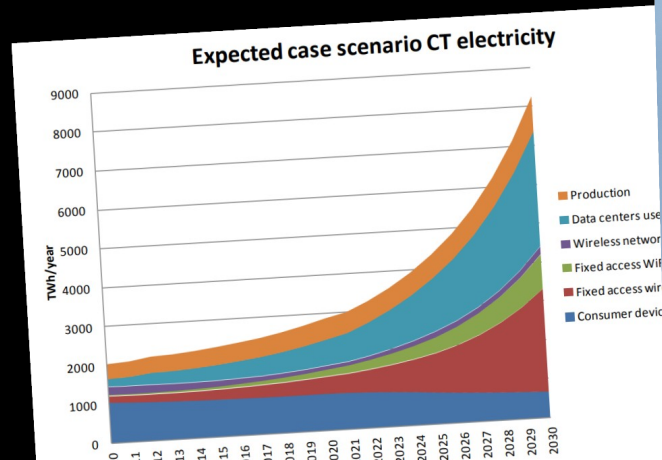


We are not alone

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](mailto: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>





