



YOUR

FRONTEND IS



Toggle dark mode

YOUR FRONTEND IS

Change colors



Toggle dark mode

YOUR FRONTEND IS

Change colors

Remove images



Toggle dark mode

***YOUR
FRONTEND IS
KILLING***

ENERGY PATTERNS



Dark UI Colors Provide a dark UI color theme to save battery on devices with AMOLED screens.	30 occurrences
Dynamic Retry Delay Whenever an attempt to access a resource has failed, increase the interval of time waited before asking access to that same resource.	12 occurrences
Avoid Extraneous Work Avoid performing tasks that are not visible/valuable to the user and/or quickly become obsolete.	32 occurrences
Race-to-idle Release resources or services as soon as possible (e.g., wakelocks, screen).	32 occurrences
Open Only When Necessary Open/start resources/services only when they are strictly necessary.	7 occurrences
Push Over Poll Use push notifications to receive updates from resources, instead of actively querying resources (i.e., polling).	18 occurrences
Power Save Mode Provide an energy efficient mode in which user experience can drop for the sake of better energy usage.	29 occurrences
Power Awareness Have a different behavior when device is connected/disconnected to a power station, or has different battery levels.	41 occurrences
Reduce Size When transmitting data, reduce its size as much as possible.	3 occurrences
WiFi Over Cellular Delay or disable heavy data connections until the device is connected to a WiFi network.	15 occurrences
Suppress Logs Avoid using intensive logging (< 1Hz).	8 occurrences
Batch Operations Batch multiple operations instead of putting the device into an active state many times.	18 occurrences



WHAT'S IN IT FOR ME?



INCOMING



(5 MIN)

GREEN SOFTWARE PRINCIPLES

(5 MIN)

SUSTAINABILITY PYRAMID

(10 MIN)

WHAT CAN WE DO?

(5 MIN)

CO2.JS (WITH LIVE TEMPLATING)

(15 MIN)



"NEXT VIDEO CREDITS TO"

~ © European Union, 2023



© European Union, 2023





VOXXEDDAYS

<CodeLab.jug>



www.koturk.nl

ABOUT KO TURK

Developer

VoxxedDays organiser

JUGLeader CodeLab.jug

Speaker

Community Lead @Rabobank

Blogger

(beginning) OpenSource committer



A person stands on dark, wet rocks at a rocky coastline during sunset. The sun is low on the horizon, creating a bright orange glow and a long, shimmering reflection on the calm water. The sky is filled with soft, colorful clouds. A large, yellow thought bubble with a black outline is positioned above the person's head, containing the word "WHY?" in bold, red, italicized capital letters with a white drop shadow. The overall mood is contemplative and serene.

WHY?

***WHO IS WORKING FOR A COMPANY THAT
HAVE MORE THAN 250 PEOPLE?***



CORPORATE SUSTAINABILITY REPORTING DIRECTIVE (CSRD)



REQUIRED BY LAW → THE CRSD



MORE THAN 250 PEOPLE

***MORE THAN 50 MILLION EURO
REVENUE A YEAR***

***MORE THAN 25 MILLION EURO
ON THEIR BALANCE***

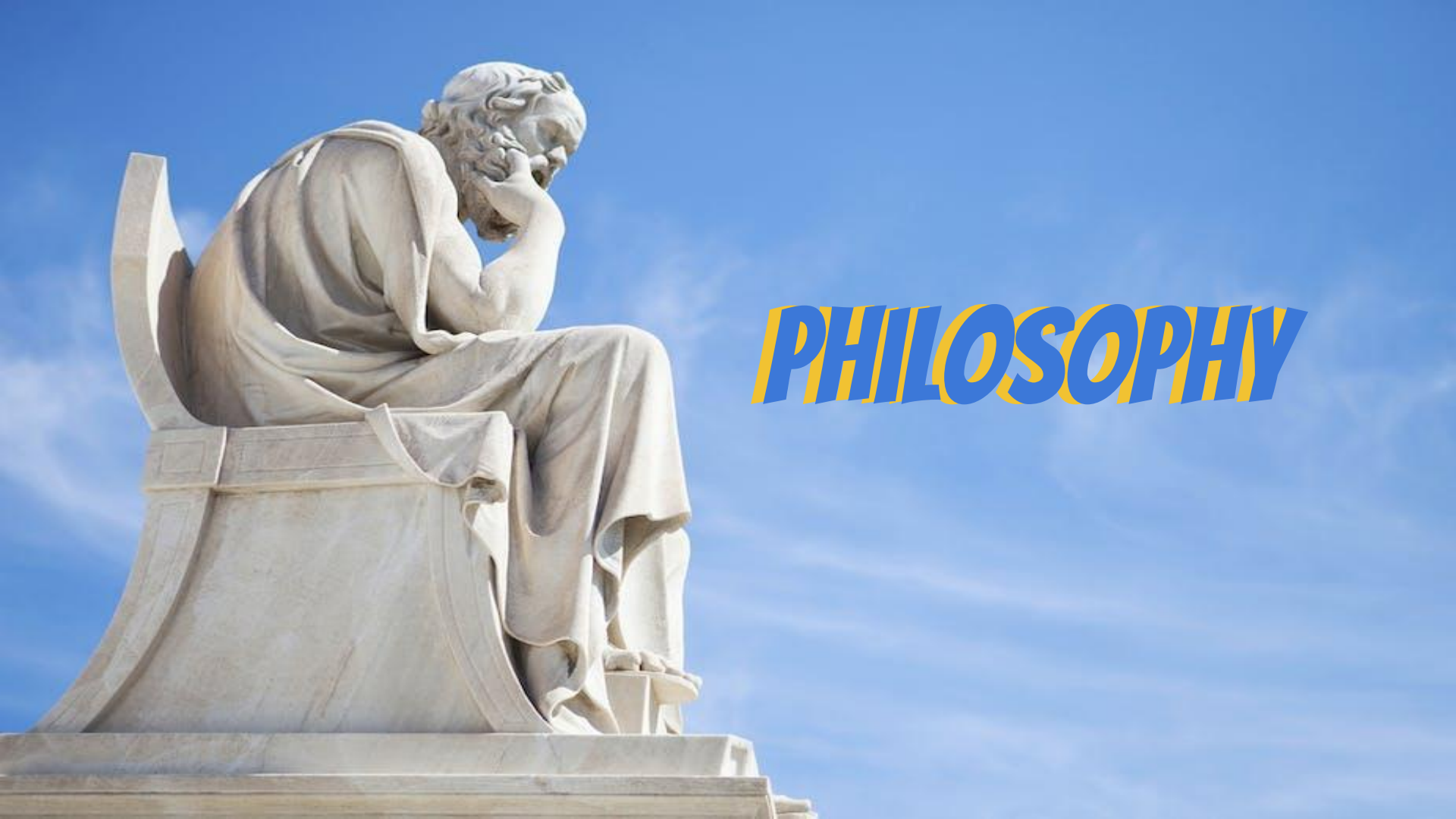
WHAT'S ABOUT IT?



SUSTAINABILITY REPORTS

***TO BE MORE TRANSPARENT
ABOUT YOUR EFFORTS TO BECOME
GREENER***





PHILOSOPHY



Green Software Principles



Energy Efficiency

Consume the least amount of electricity possible



Hardware Efficiency

Use the least amount of embodied carbon possible



Carbon Awareness

Do more when the electricity is clean and less when it's dirty



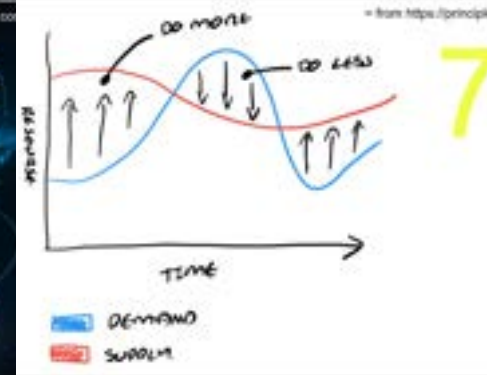
8 PRINCIPLES OF GREEN SOFTWARE ENGINEERING

~ from <https://principles.green/>



GREEN CODING PRINCIPLES

Developers needs to think about this points





END USER



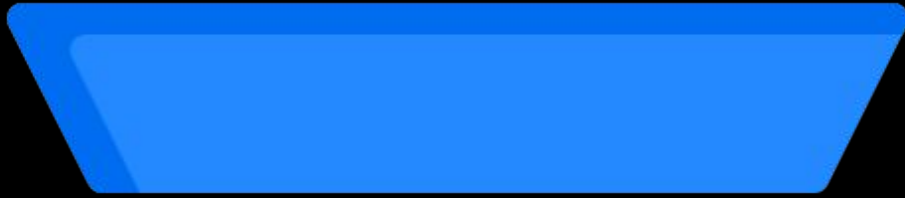
DATA CENTER



NETWORK



YOUR CODE



END USERS



DATA CENTER



NETWORK



YOUR CODE



END USERS



DATA CENTER



NETWORK



YOUR CODE

Changing our behaviour

Green Software for Practitioners (LFC131)

Learn the basic concepts a software practitioner needs to know to build, maintain and run greener applications.

Course Rating

★★★★★ 4.4/5 Stars



Who Is It For

This is an introductory course designed for software practitioners.



What You'll Learn

This course provides a framework to educate software practitioners in topics related to green software. Learners will explore green principles, understand and use shared

[read more](#)



What It Prepares You For

This course will teach you how to apply green software principles to the design and development of your software applications. It lays out the guidelines to help create a

[read more](#)



\$0

Login Using My Portal Before Enrolling

Enroll Today

Includes

- Online, Self Paced
- 2 Hours of Course Material
- Quizzes
- Unlimited Access to Online Course
- Digital Badge

ECOSIA

Search the web...



207,323,429

trees planted by Ecosia



€85,021,220

dedicated to climate action

Search engine

Search engine used in the address bar. [Learn more](#)

Ecosia

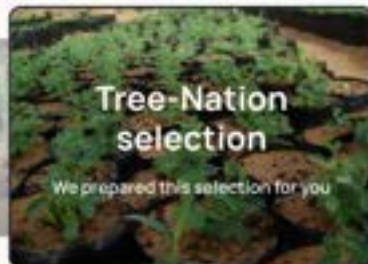
Manage search engines and site search



THE FOREST OF
Ko Turk

1 Select a plantation project

Where would you like to plant your trees?



Project:	Reforestation and Conservation
Species:	Quercus robur
Trees per recipient:	1
Number of recipients:	1
Trees to plant:	1
Total CO2 offset:	140 Kg
Total price:	2,50 €

Plant your trees

[Learn how to offer trees](#)

Credits in your account:

0 €

2 Choose one species

This is a short list of species we selected for you. Pick one species or select a project in the section above.











END USERS



DATA CENTER



NETWORK



YOUR CODE



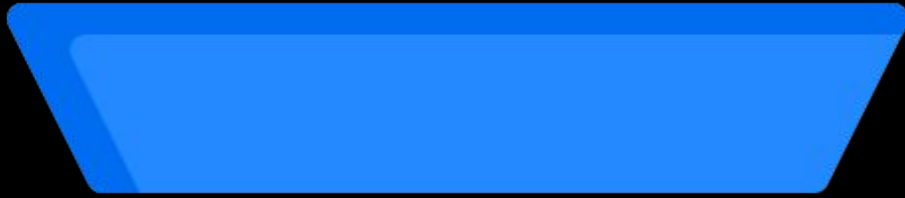
*Choose your datacenter
wisely*

[HTTPS://APP.GREENWEB.ORG/DIRECTORY/](https://app.greenweb.org/directory/)

Coming from running our apps / storage from datacenters

Country	Number of Data Centers
U.S.	2701
Germany	487
UK	456
China	443
Canada	328
Australia	287
Netherlands	281

- 
- 🌳 Lights
 - 🌳 Cooling
 - 🌳 Servers
 - 🌳 Monitors
 - 🌳 Network
 - 🌳 Storage Drives



END USERS



DATA CENTER



NETWORK



YOUR CODE





NETWORK ARCHITECTURE

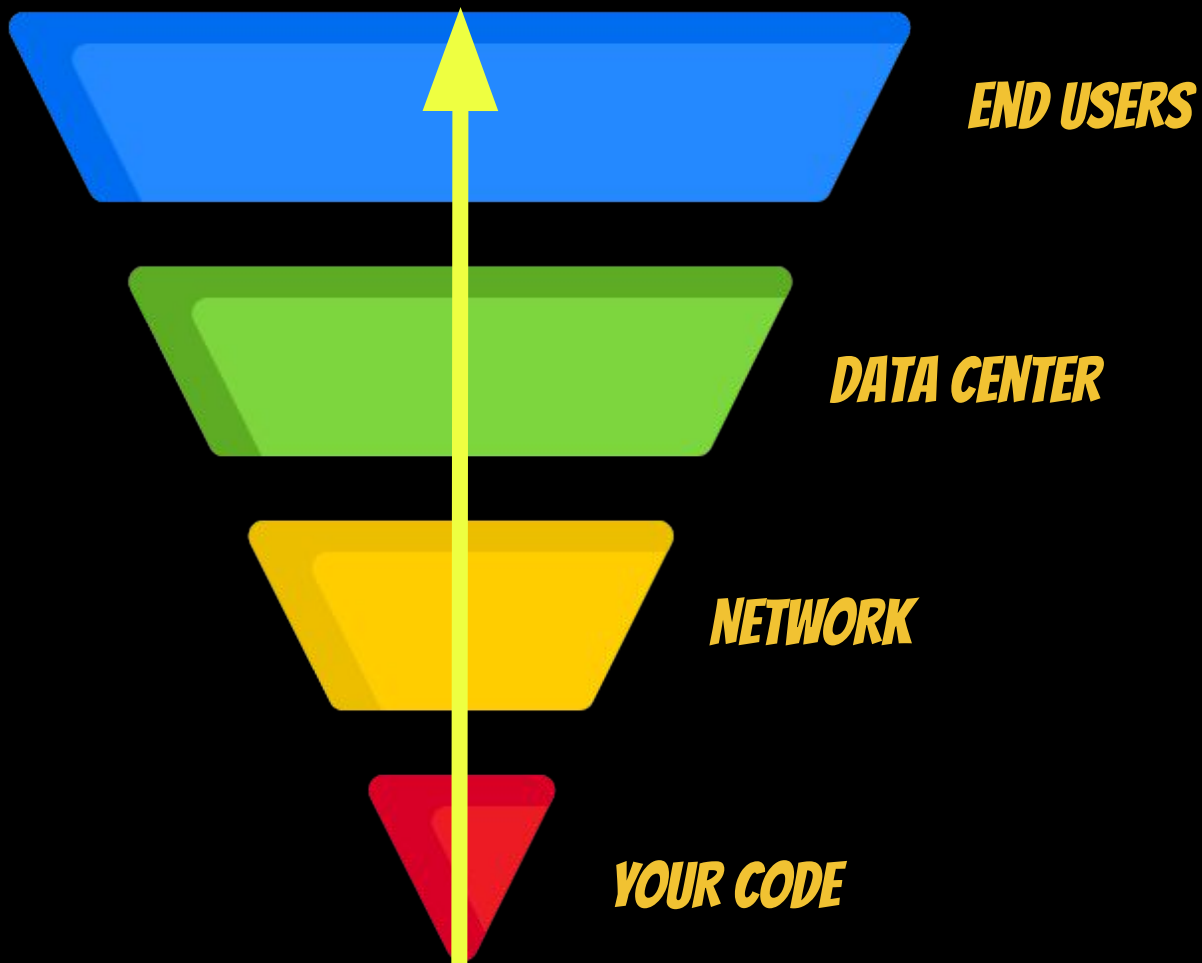




TikTok

@iamlilbonar





X 1000000 users



END USERS

DATA CENTER

NETWORK

YOUR CODE

*Run your applications on a
certain time*





Ronald Dehuysser @rdehuyss · 17 jun.



Part of the revenue I make with [@JobRunr](#) goes to [@teamtreesofficial](#) - because as I think that the boyscout rule is applicable everywhere, also in the real world.

LEADERBOARD

SEARCH

MOST RECENT

MOST TREES



JOBRUNR

JobRunr

New license, new trees!

225 trees

17/06/2023, 11:51:06



JOBRUNR

JobRunr

New license, new trees!

75 trees

17/06/2023, 11:48:56



GOTO
WEBSITECARBON.COM





Uh oh! This web page is dirtier
than **98%** of web pages
tested



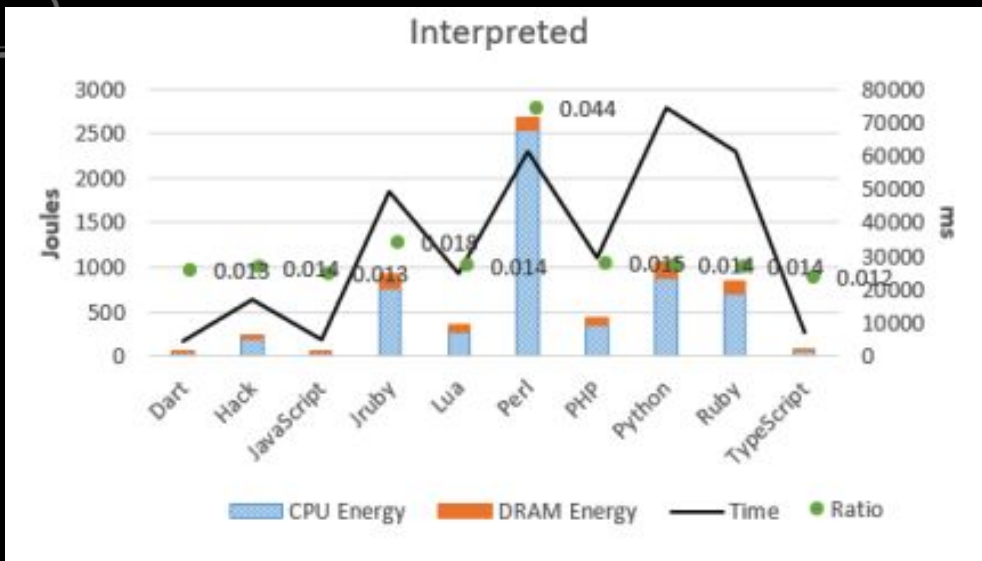
Oh my, **4.96g of CO₂** is produced every
time someone visits this web page.




Oh no, it looks like this web page uses
bog standard energy

← If this site used green hosting, then it
would emit 9% less CO₂

TYPESCRIPT IS A GOOD CHOICE



A close-up photograph of a woman with dark hair, her face partially obscured by her hand as she covers her eyes. She has a distressed or frustrated expression, with her mouth slightly open and her hand pressed against her face. The background is a plain, light-colored wall.

**I install only one npm
package**

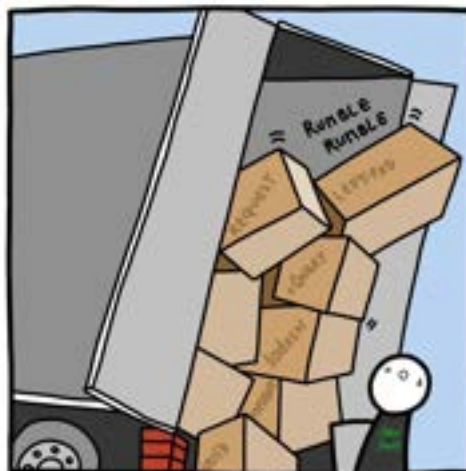
**it installs
another 376 dependencies**

LIFE IS LIKE AN NPM INSTALL



YOU NEVER KNOW WHAT YOU'RE GONNA GET

imgflip.com



VINCENTDNL
Instagram Twitter

CO2.JS



***IS AN OPEN-SOURCE JAVASCRIPT LIBRARY
THAT ENABLES DEVELOPERS TO ESTIMATE
THE EMISSIONS RELATED TO USE OF THEIR
APPS, WEBSITES, AND SOFTWARE***

CO2.JS

WHAT?

Calculate amount of
grams of CO2

BYTES TO CO2

HOW?

Javascript library

METHODS

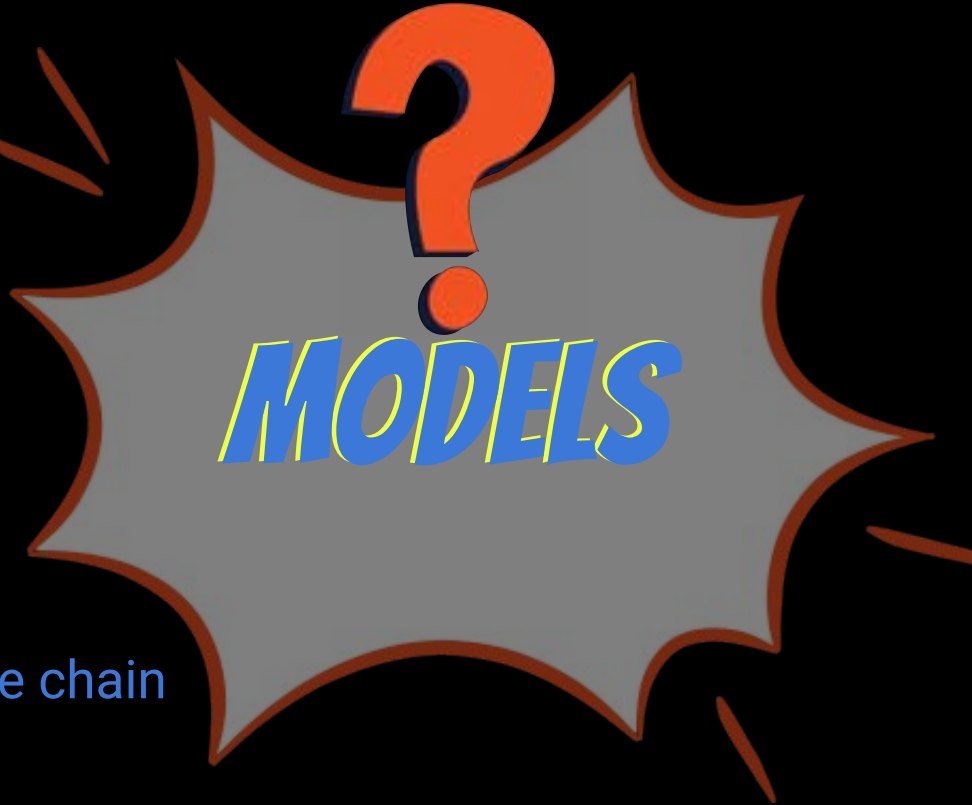
PerByte
PerVisit
PerPage



SWD MODEL



Calculates the whole chain

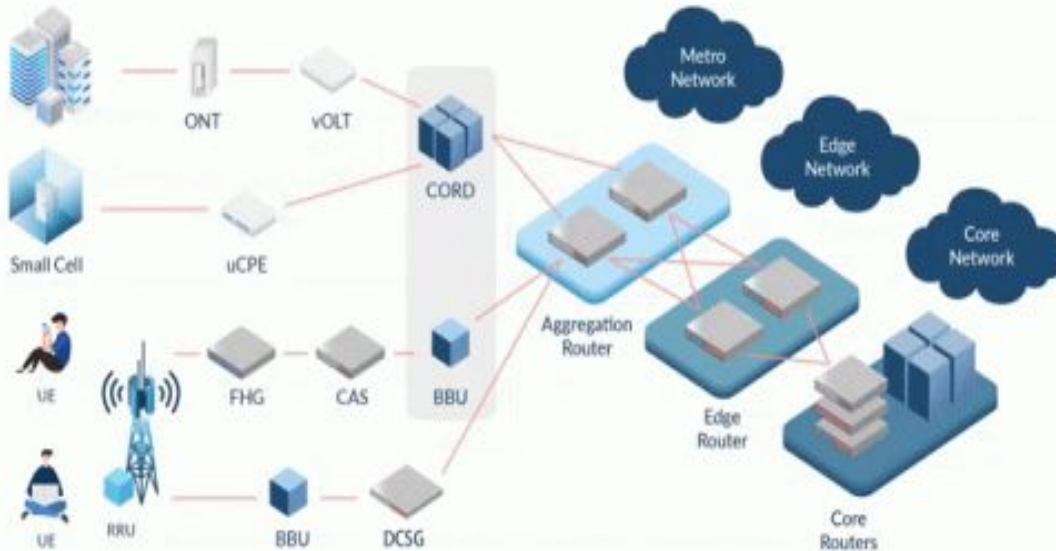


1BYTE



Calculates the amount of CO2
emissions used over the wire

1BYTE MODEL



Datacentre usage

15% of total figure



Carbon emissions from electricity to power servers, and keep them cool

Network transfer

14% of total figure



Carbon emissions from electricity to power core networks, mobile networks, on-premise wifi and wired routers

SWD MODEL

How the Sustainable Web Design model allocates energy usage

Datacentre usage

15% of total figure



Carbon emissions from electricity to power servers, and keep them cool

Network transfer

14% of total figure



Carbon emissions from electricity to power core networks, mobile networks, on-premise wifi and wired routers

End user device usage

52% of total figure



Carbon emissions from electricity to power end user devices - laptops, workstations, smartphones and tablets

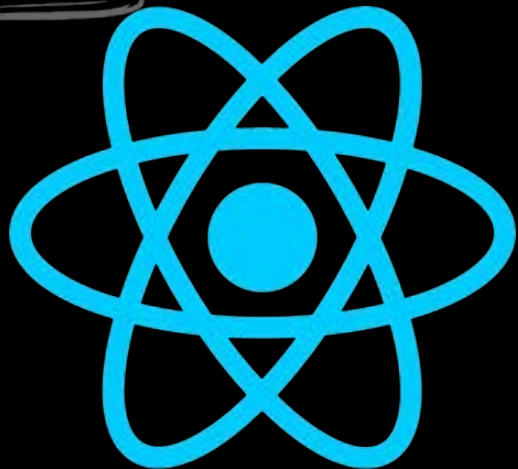
Production

19% of total figure



Carbon emissions from making the devices themselves - processing silicon and other raw materials into integrated circuits, batteries, metal casings, and so on

TECHNIQUES





A **fully featured** React components library

Build fully functional accessible web applications faster than ever – Mantine includes more than 100 customizable components and 50 hooks to cover you in any situation



Free and open source

All packages have MIT license, you can use Mantine in any project



TypeScript based

Build type safe applications, all components and hooks export types



Use anywhere

Mantine supports all modern frameworks: Next.js, Remix, etc.

[Get started](#)[GitHub](#)

LET'S MEASURE

AVERAGES

HOSTS

PER VISIT

COMPARING TO CARS

10.000 VIEWS

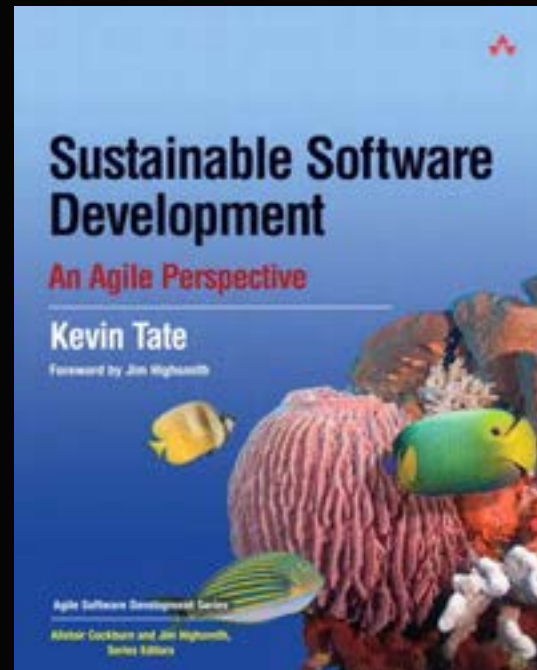
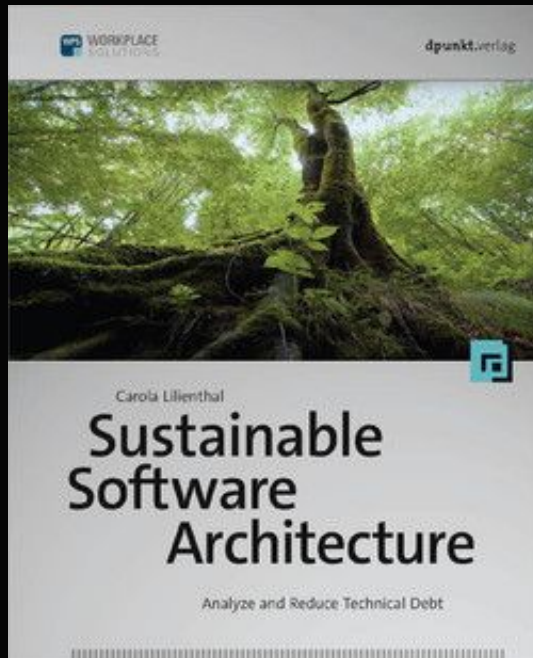
IMAGES / VIDEOS



DEMO



(e)books



3 KEY TAKEAWAYS



- 1. ECO FRIENDLY ARCHITECTURE***
- 2. MEASURE EVERYTHING!
YOUR FRONTEND WITH CO2.JS***
- 3. SMALL ENHANCEMENTS, BIG IMPACT
(DOWNSIZE, CACHING)***

Your frontend is 💀 ⚠️ Let's measure its impact with CO2.js

How sustainable is your code? Ever thought about how many CO2 emissions your code is producing? Probably not! But nowadays the climate is changing harder, and we need to do something! Why are we not beginning with measuring the code we make? Let's start with checking the front-end code!

The Green Web Foudation created an open-source JavaScript library that enabled developers to calculate the CO2 emissions based in the number of bytes.

How to start?

To use the library we need to install version 14 of Node or higher, which you can install [here](#)

After installing node, we install the co2 package with npm version 6 or newer:

```
npm install @tgwf/co2
```

You're now ready to use the library (server-side) with:

```
const {co2} = require("@tgwf/co2")
```





***THANK YOU AND
KEEP CODING***

IP TO CO2 INTENSITY API

<https://www.thegreenwebfoundation.org/ip-to-co2-intensity-api/>

Firefox DevTools (Firefox Profiler)

<https://www.thegreenwebfoundation.org/news/carbon-emissions-in-browser-devtools-firefox-profiler-and-co2-js/>