



SWIFTCRAFT
21-24 May 2024

Sustainable Mobile Apps

How to Create One

Jane Bondar

KEY FACTS ABOUT ME

- ◆ 10+ years in mobile tech
- ◆ Lead a team of 50+ developers at NIX
- ◆ Focused on streamlining processes
- ◆ Enjoy freediving and hiking in my free time



Jane Bondar

Mobile Development Lead



THE IMPACT OF GREENHOUSE GASSES

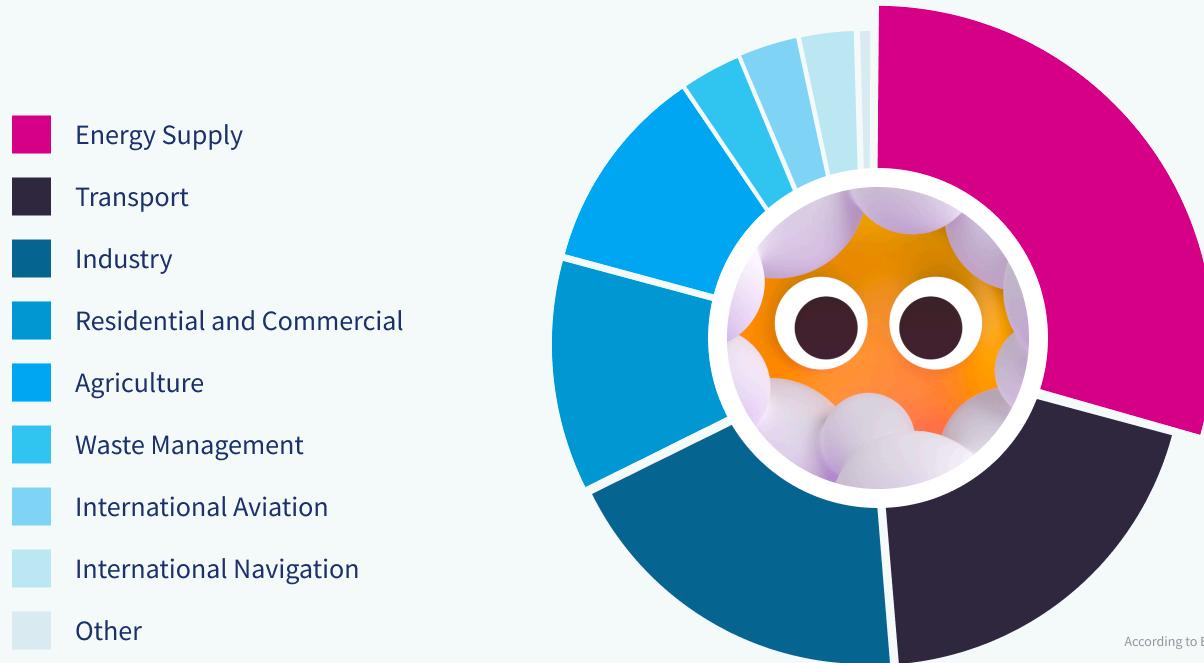


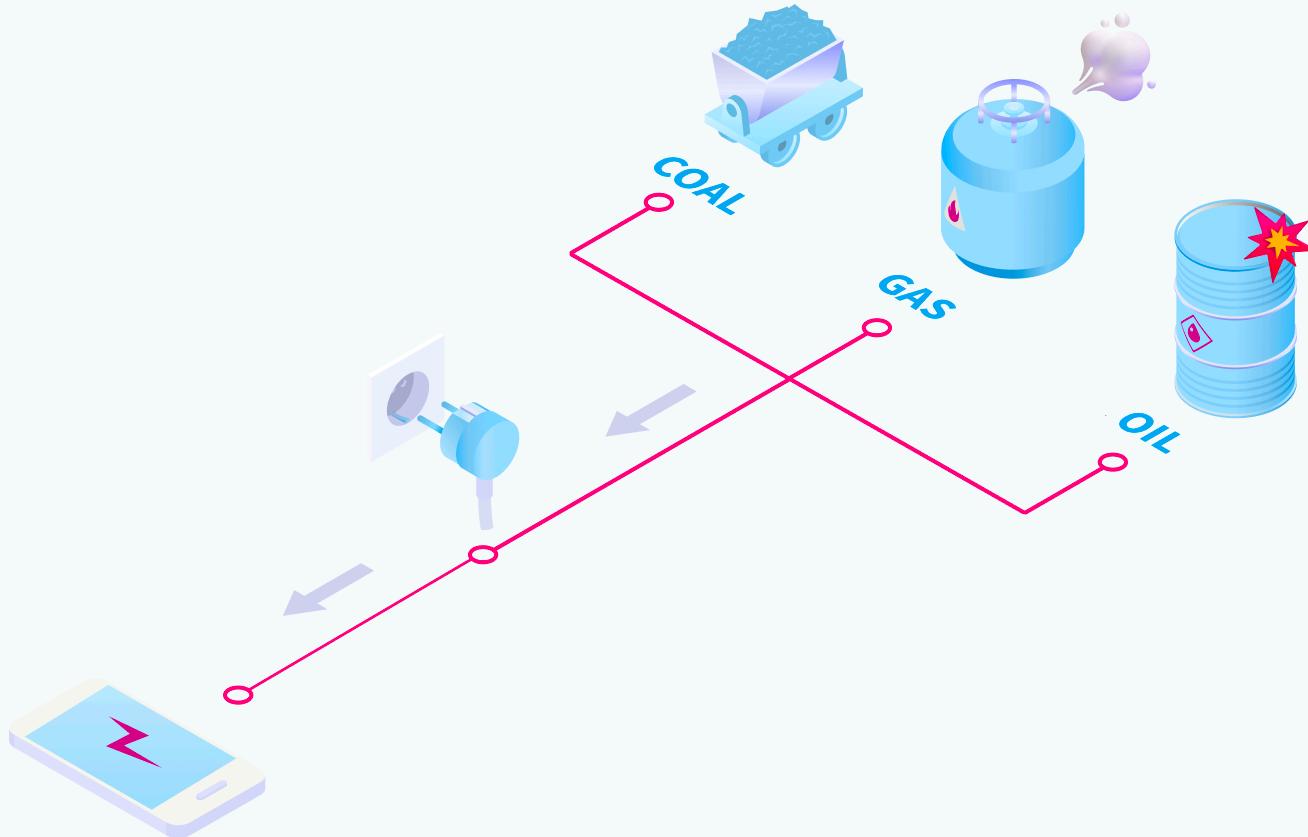
CARBON IS CO_2

a concept encompassing the influence of emissions and various activities on the phenomenon of global warming.

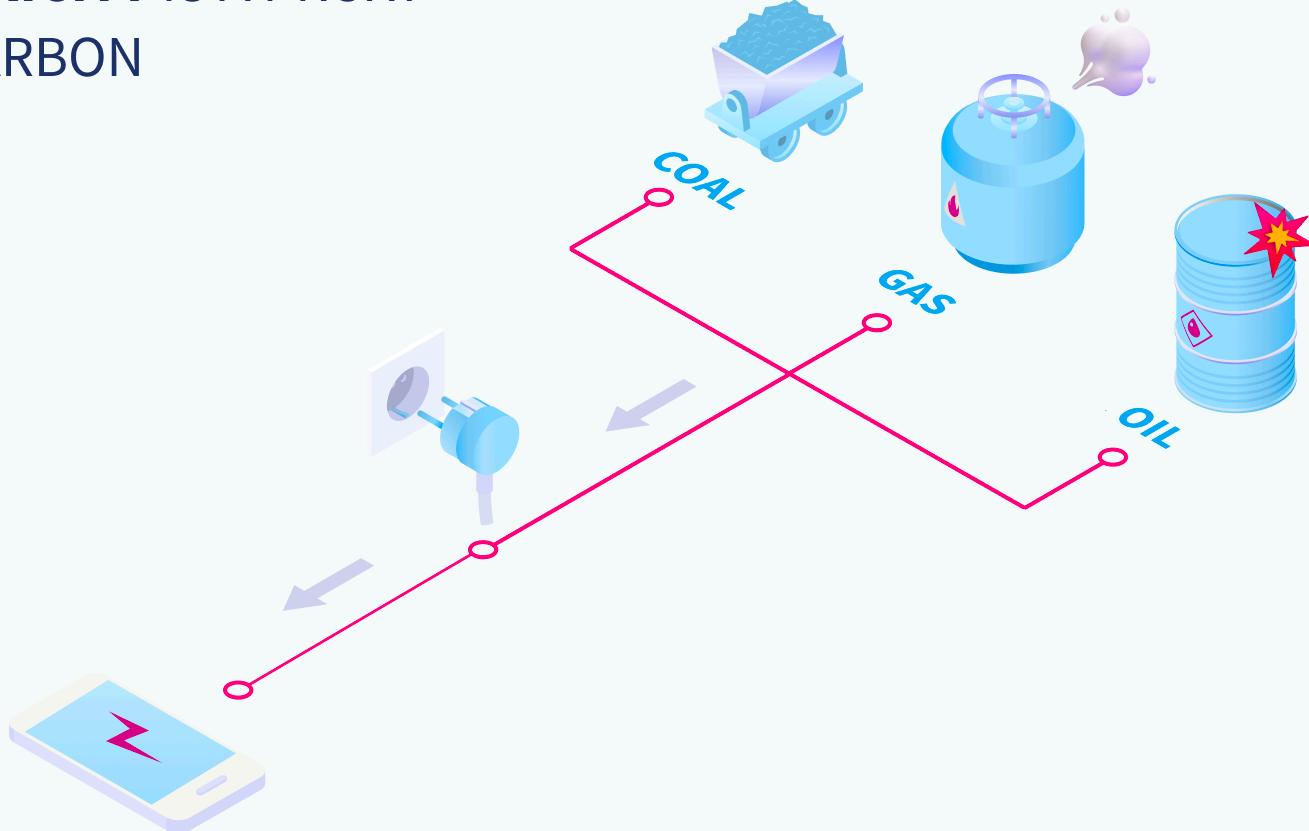


THE PRIMARY SOURCE OF CARBON EMISSIONS STEMS FROM THE BURNING OF FOSSIL FUELS.

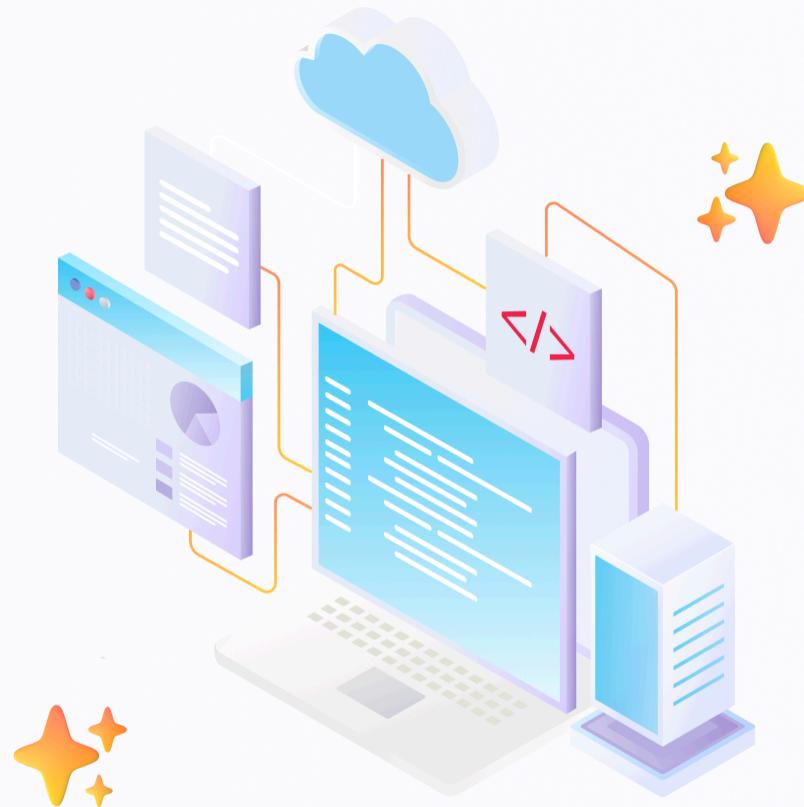




ELECTRICITY IS A PROXY FOR CARBON



INTERPLAY BETWEEN SOFTWARE & HARDWARE



WHAT WE WILL **DISCUSS**

- 1 What practices will help us?
- 2 How do we measure their impact?
- 3 How much (money) do we need to invest?



GREEN SOFTWARE PRINCIPLES

Energy Efficiency

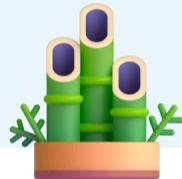
Consume the least amount of electricity possible

Hardware Efficiency

Use the least amount of embodied carbon possible

Carbon Awareness

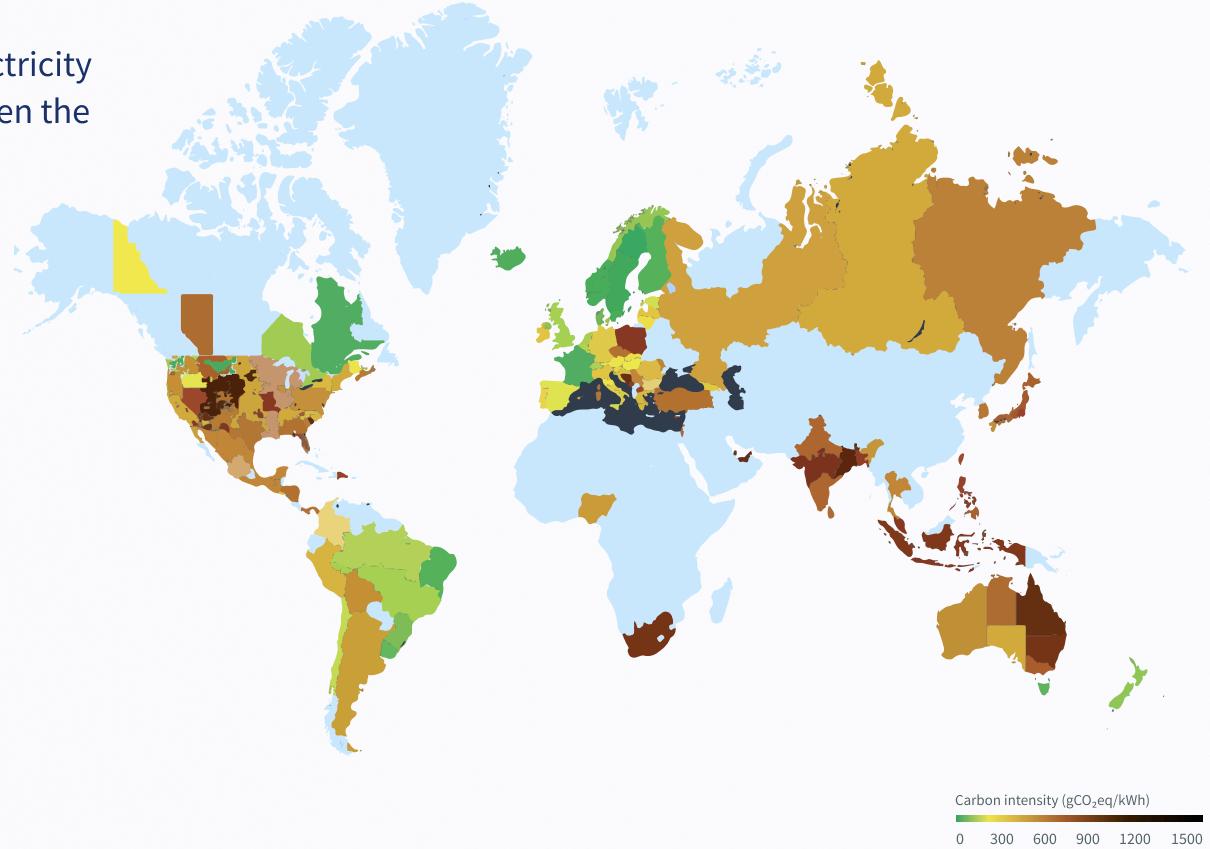
Do more when the electricity is clean and less when it's dirty



According to the Green Software Foundation

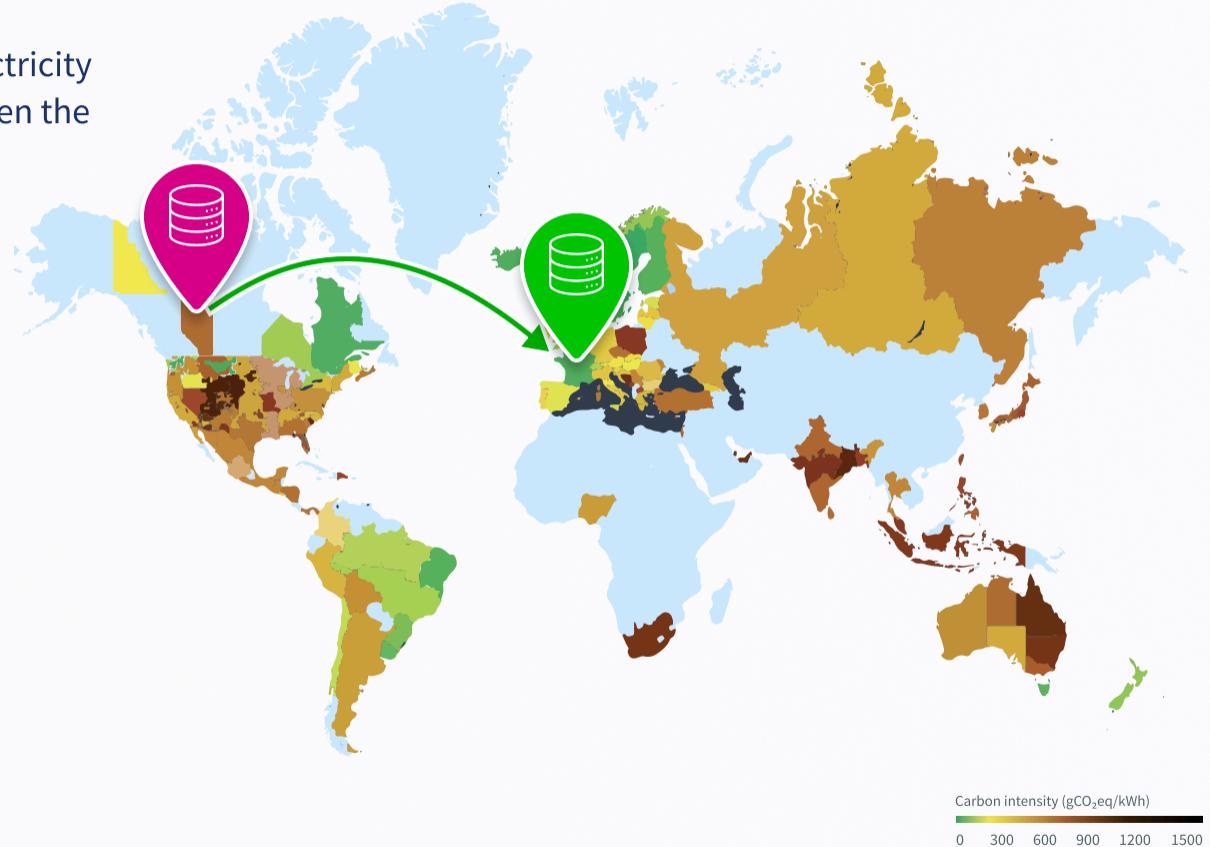
CARBON AWARENESS

is doing more when the electricity
is cleaner and doing less when the
electricity is dirtier.



CARBON AWARENESS

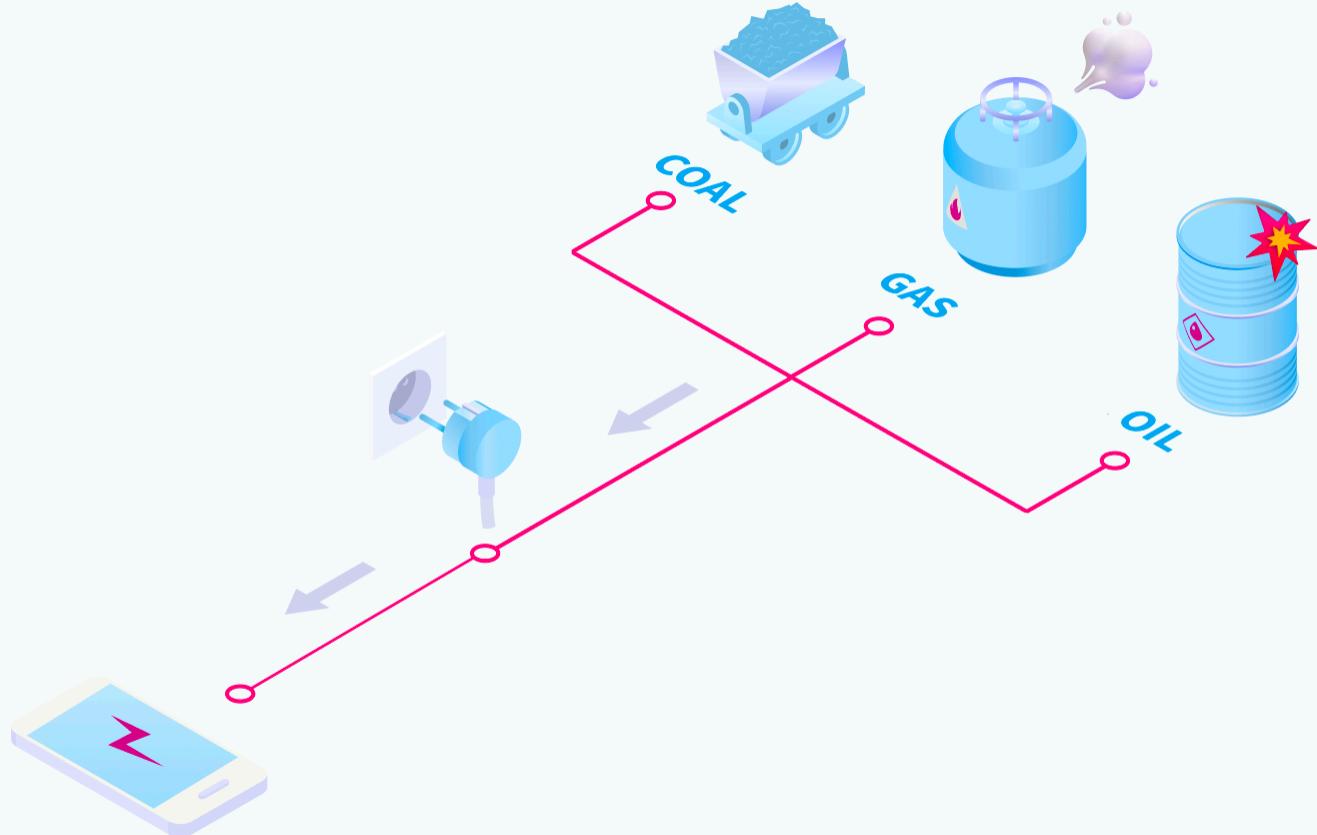
is doing more when the electricity
is cleaner and doing less when the
electricity is dirtier.



CARBON AWARE SDK

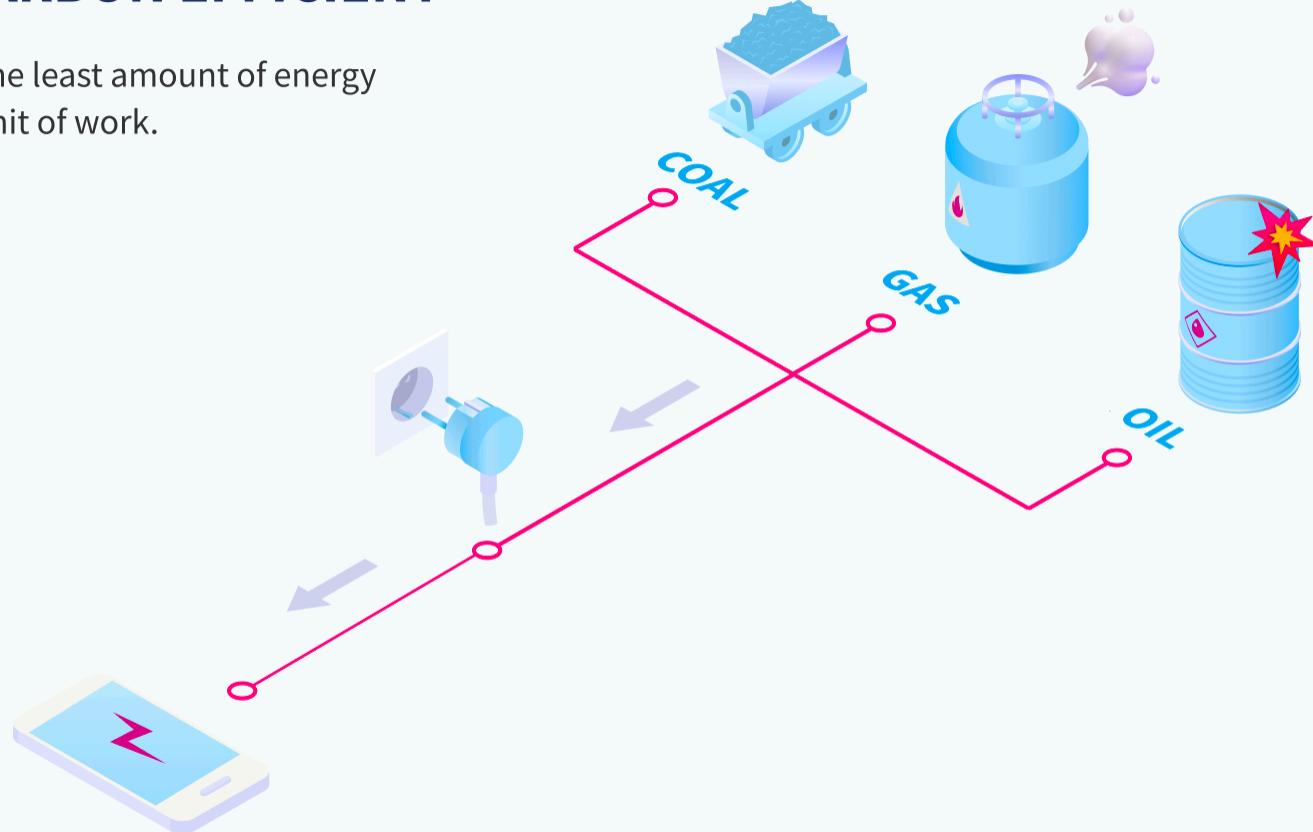
WebApi and CLI to assist in building carbon aware software





BEING CARBON EFFICIENT

means using the least amount of energy possible per unit of work.



BEING CARBON EFFICIENT



ON CLOUD

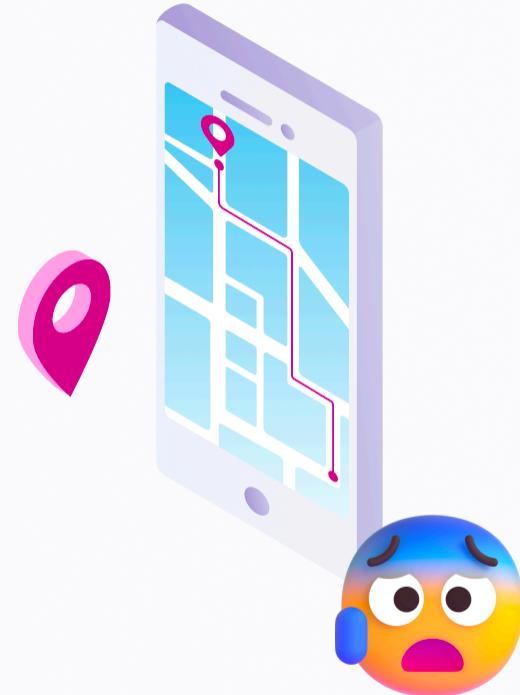
Use the least amount of embodied carbon possible

ON CLIENT

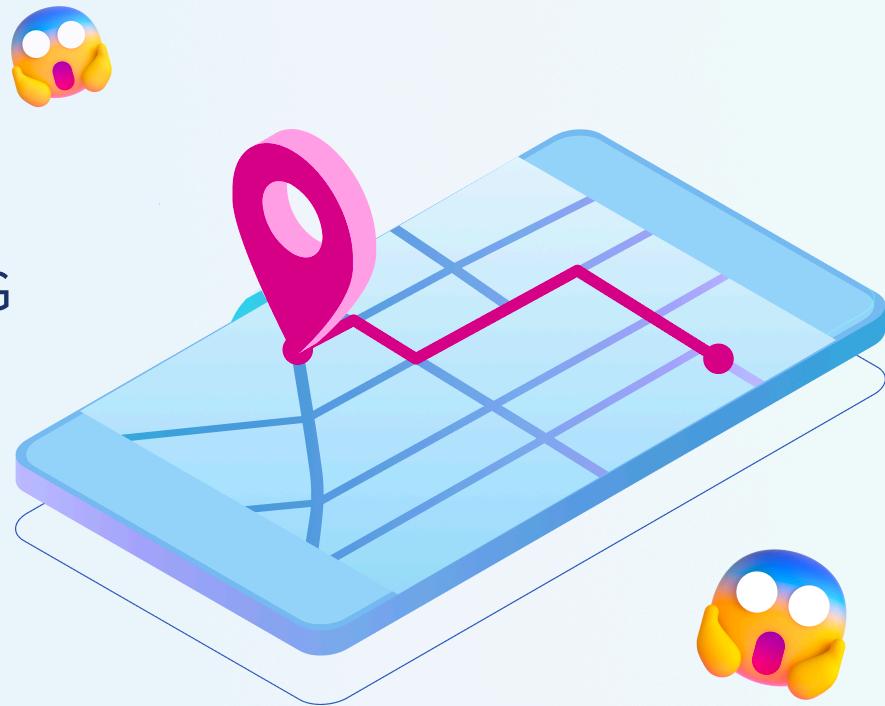
Minimize unnecessary operations



**LOCATION TRACKING IS ONE
OF THE MOST BATTERY
DRAINING FEATURES**

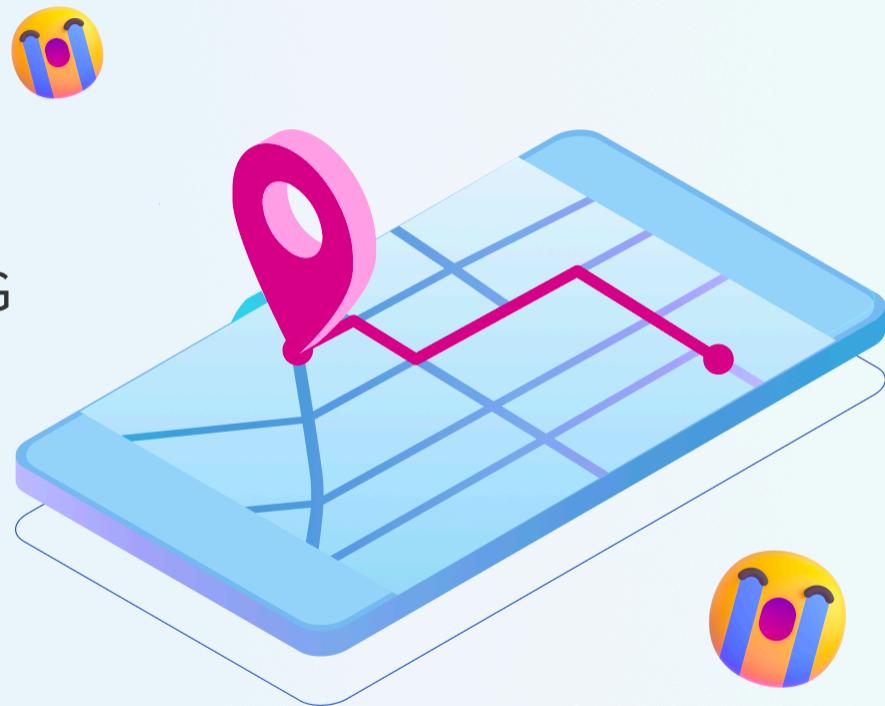


CONSTANT LOCATION TRACKING

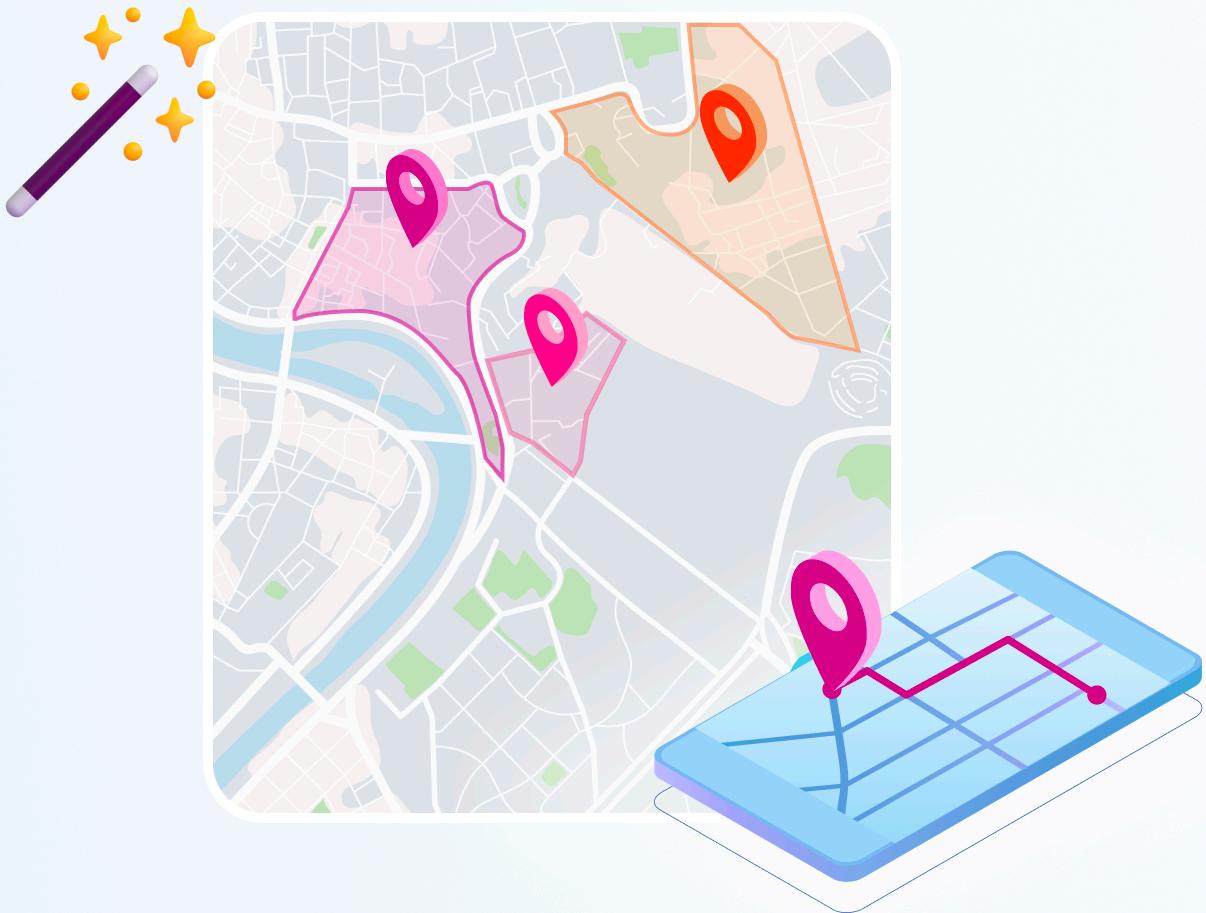


CONSTANT LOCATION TRACKING

DO WE ACTUALLY NEED IT?



GEOFENCING



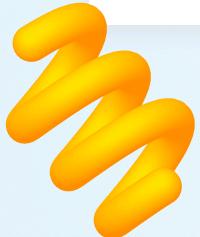
WAYS TO OPTIMIZE LOCATION TRACKING

Geofencing

Tracking Specific Activity Only

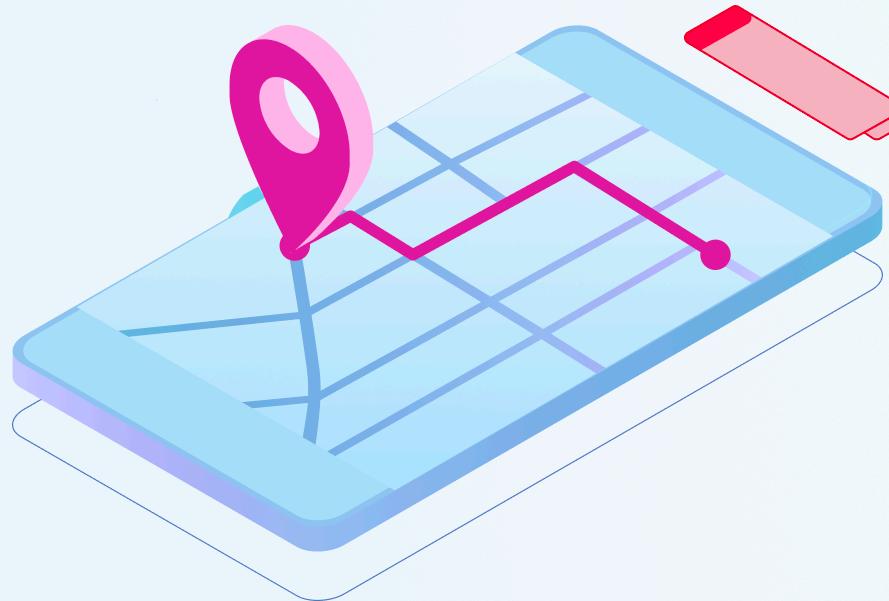
Tracking Significant-Change Updates
Only

Reducing Accuracy And Frequency
Of Location Updates

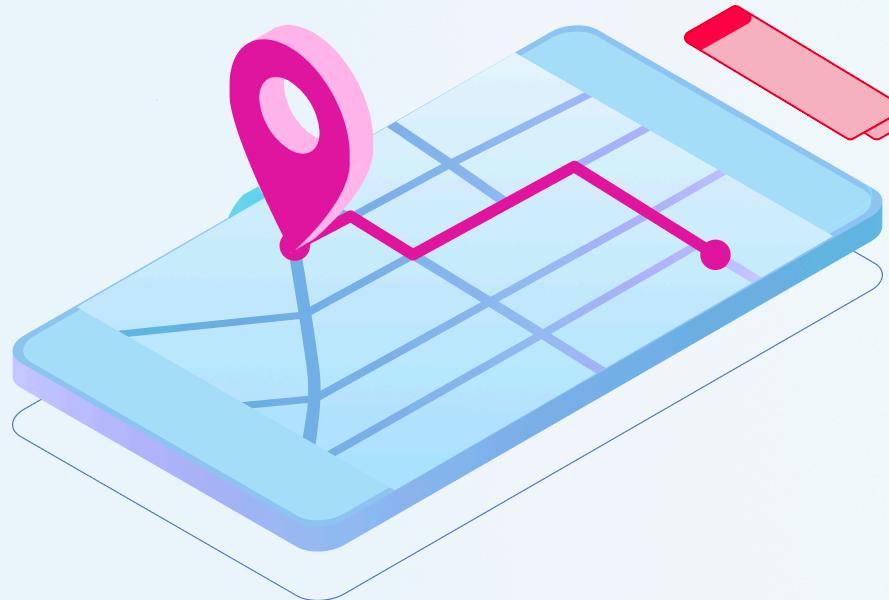


LEGACY CODE OPTIMIZATION CASE

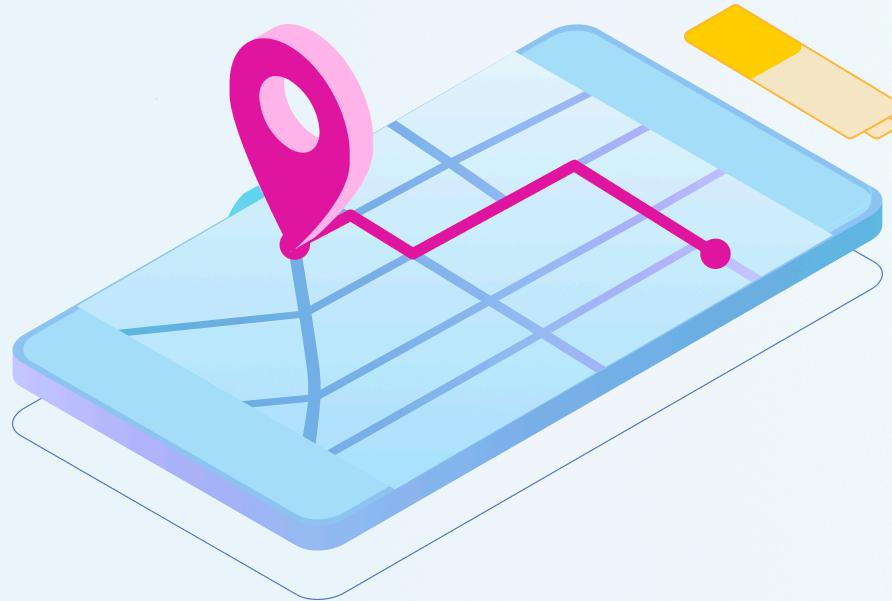
a location-based social network app



BEST ACCURACY AND FREQUENCY



~~BEST ACCURACY AND
FREQUENCY~~



ENERGY EFFECTIVE MOBILE SOLUTIONS HELP YOU

- ◆ Save the device's battery
- ◆ Make the user experience better
- ◆ Avoid wasted data transmission, storage and processing



FACTORS THAT INFLUENCE ENERGY CONSUMPTION WHILE NETWORKING

- ◆ Cellular vs Wi-Fi
- ◆ Signal strength
- ◆ Location and service provider, etc.



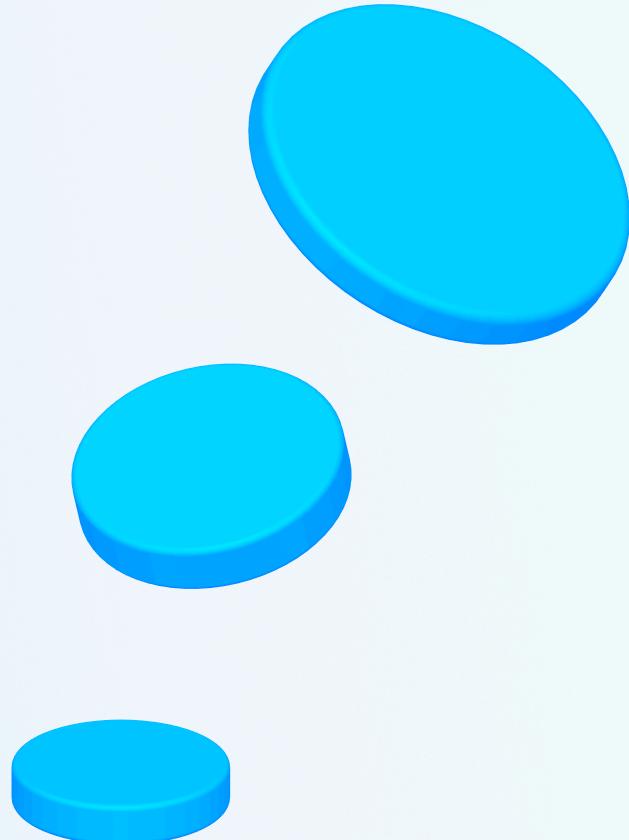
MINIMIZATION & DEFERRING



MINIMIZATION

Caching And Compressing Data

Decreasing Media Quality And File Size

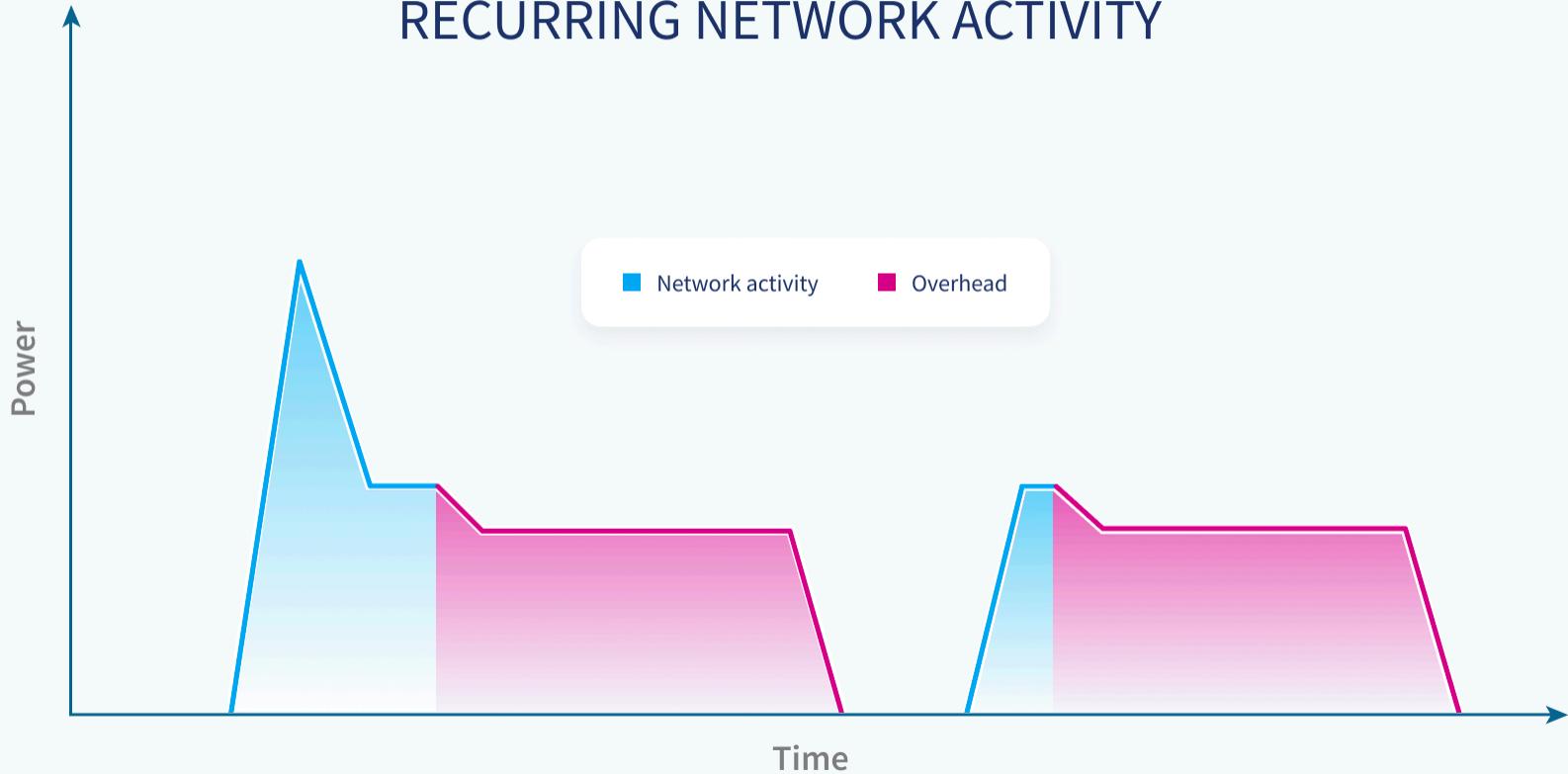


VIDEO CONFERENCING SOFTWARE REDUCES STREAMING QUALITY FOR:

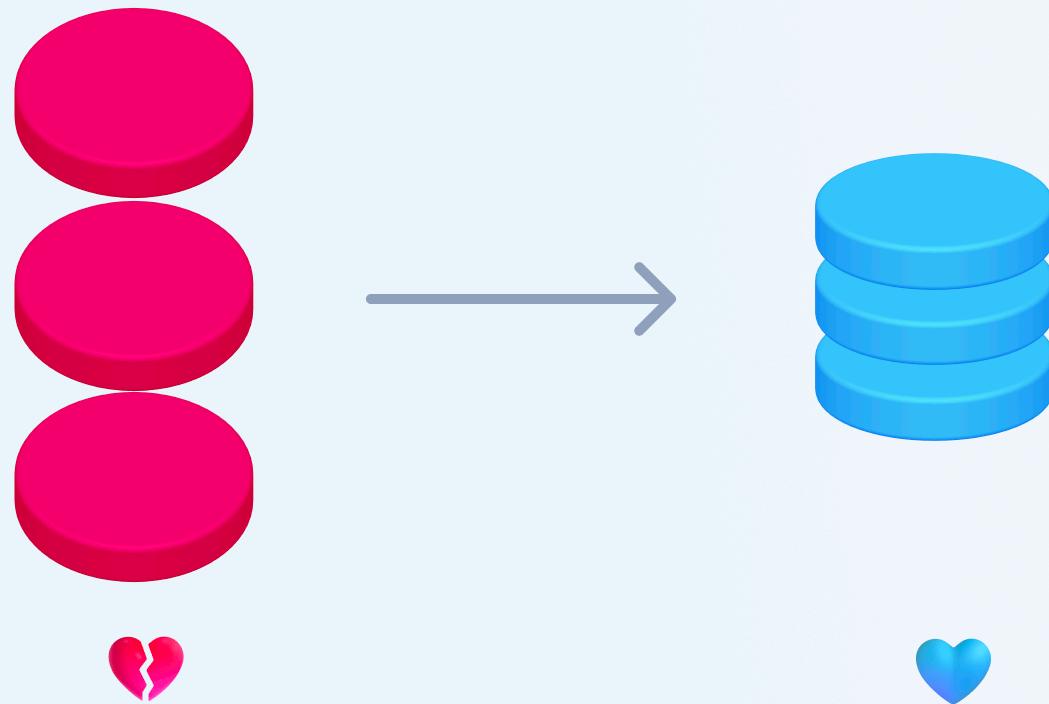
- ◆ Low bandwidth
- ◆ Cellular connection
- ◆ Phone's low power mode, etc.



EXAMPLE OF **OVERHEAD** DUE TO RECURRING NETWORK ACTIVITY



CONSOLIDATE NETWORK OPERATIONS



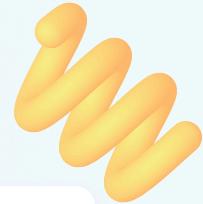
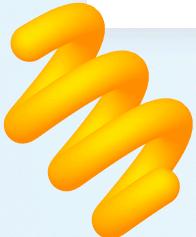
POSTPONE NON-ESSENTIAL NETWORK TASKS TO TIMES WHEN:

They Can Be Batched With Others

Bandwidth Is Good

The Device Is Charging

The Device Is Using Wi-Fi, Etc.





1:22

WAKING THE SYSTEM FROM AN
IDLE STATE **INCURS AN**
ENERGY COST



USE TIMERS WISELY

Specify Suitable Timeouts



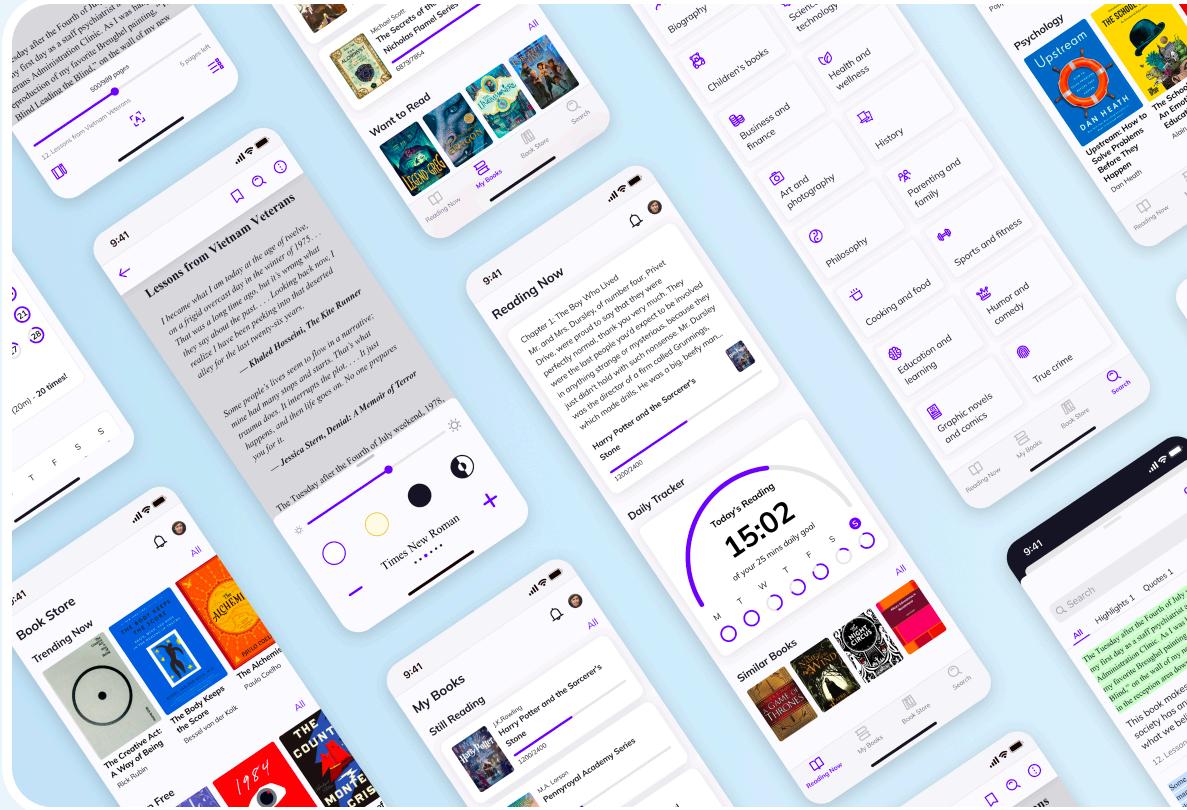
Invalidate Right After You Don't
Need Them Anymore

**RELY ON EVENTS RATHER
THAN EXACT TIMES**

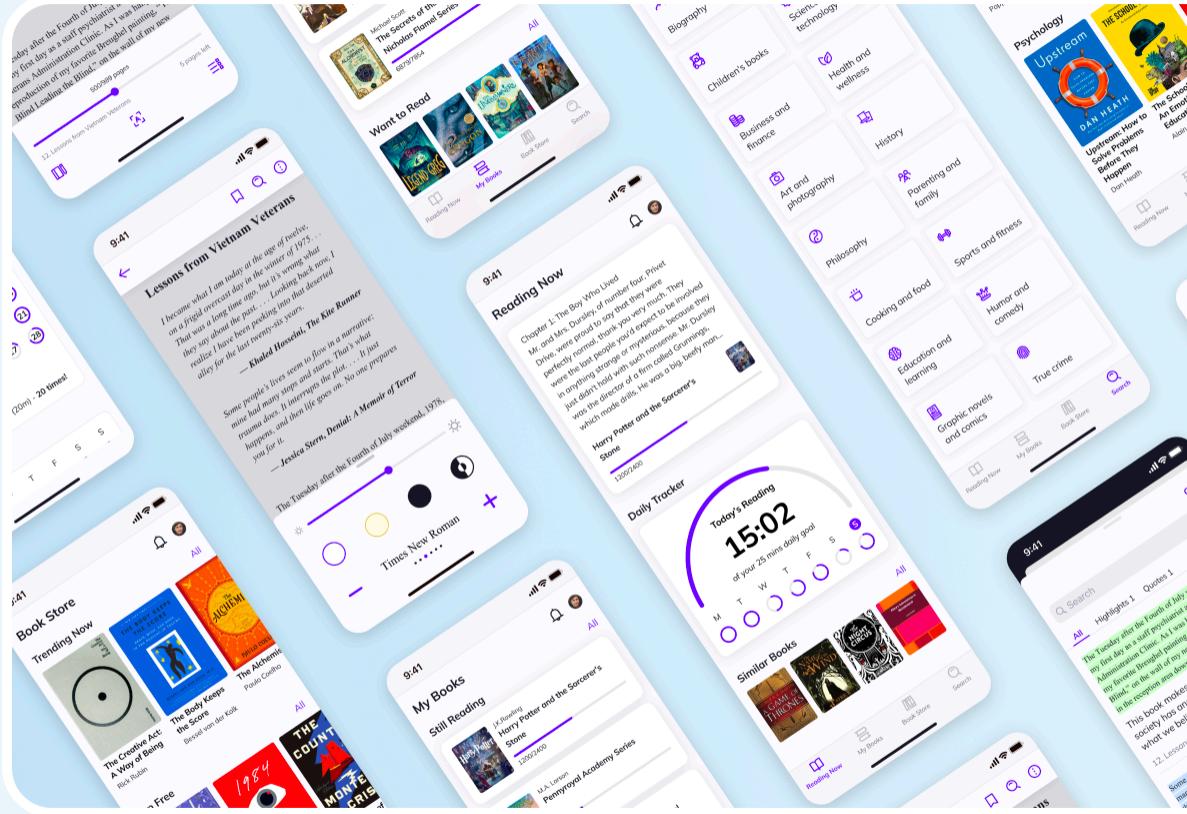


**USE LOCAL AND DEFERRED
NOTIFICATIONS WHEN
POSSIBLE**

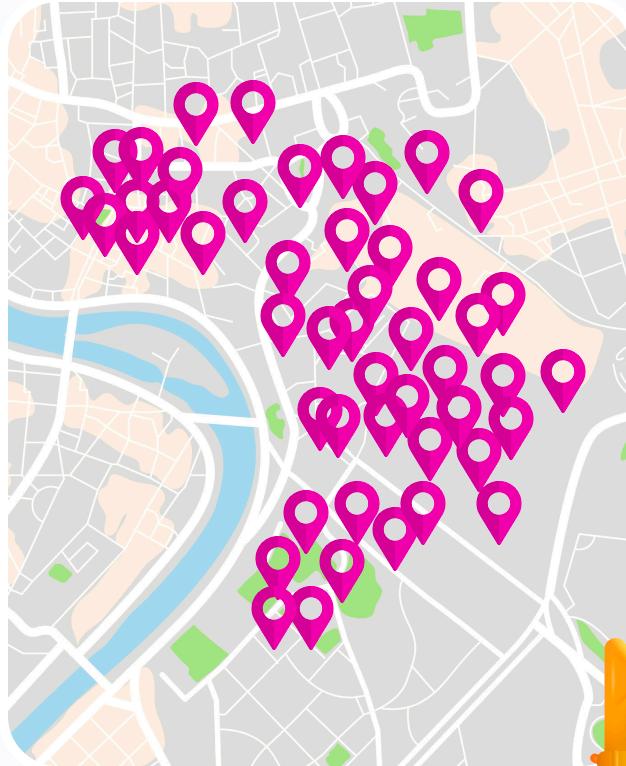


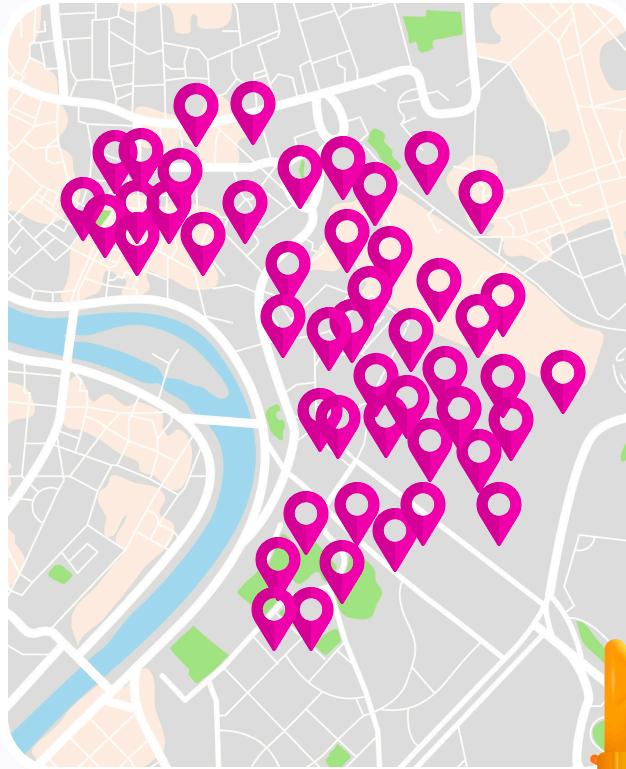
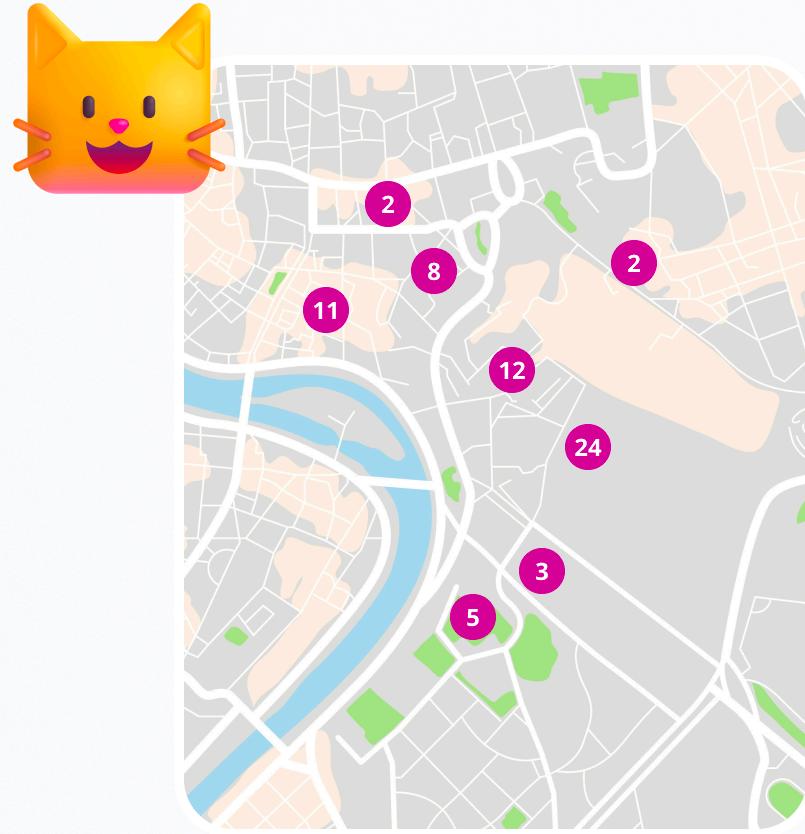


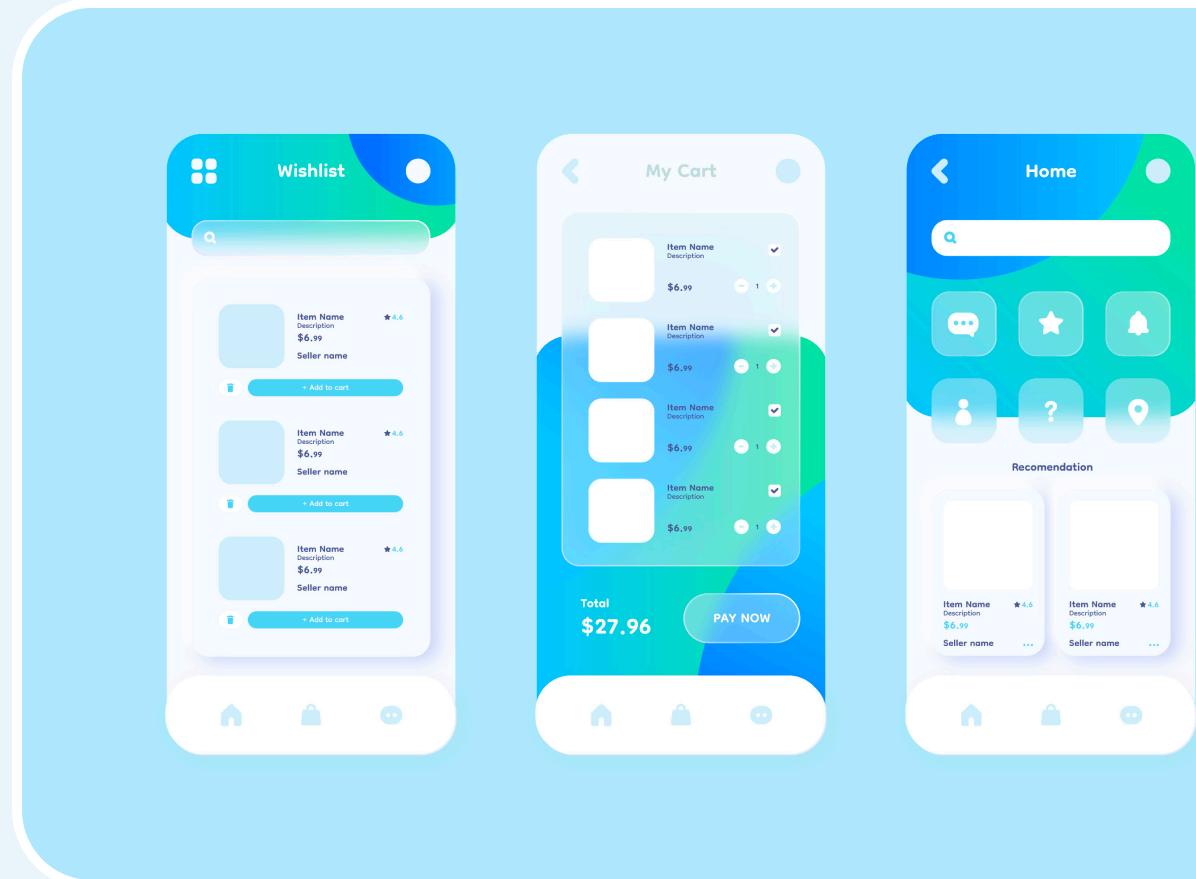
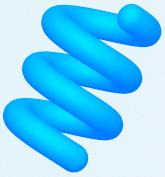
ENSURE DESIGN ENERGY EFFICIENCY

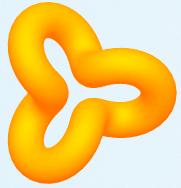


**REMOVE DRAWING WHEN
CONTENT IS NOT VISIBLE**

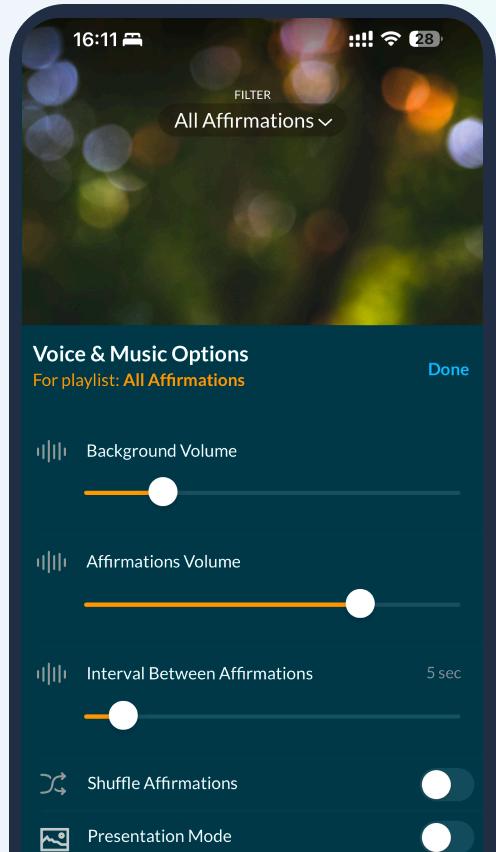
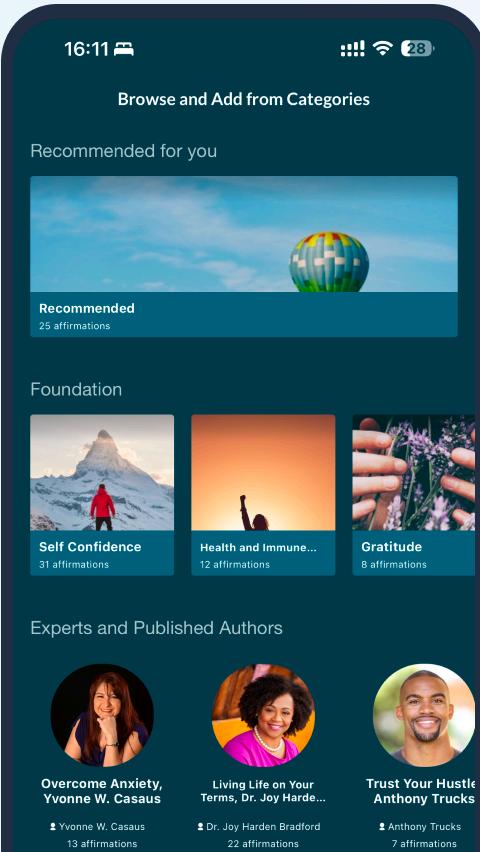


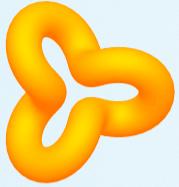






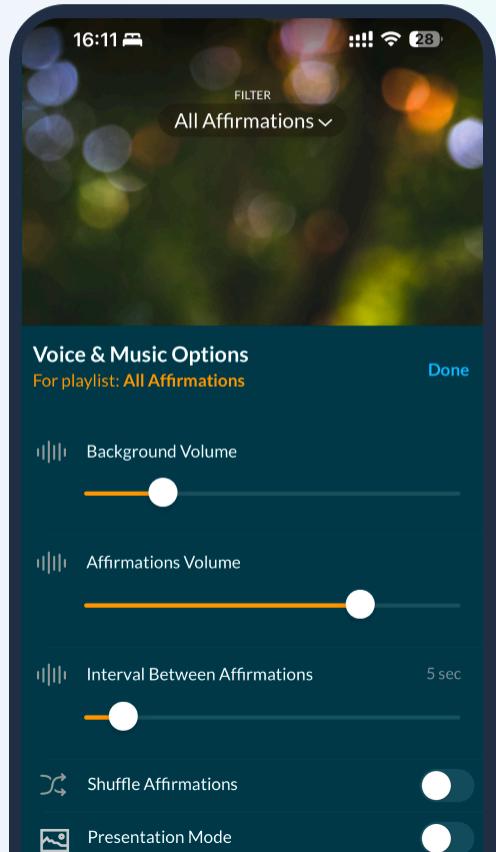
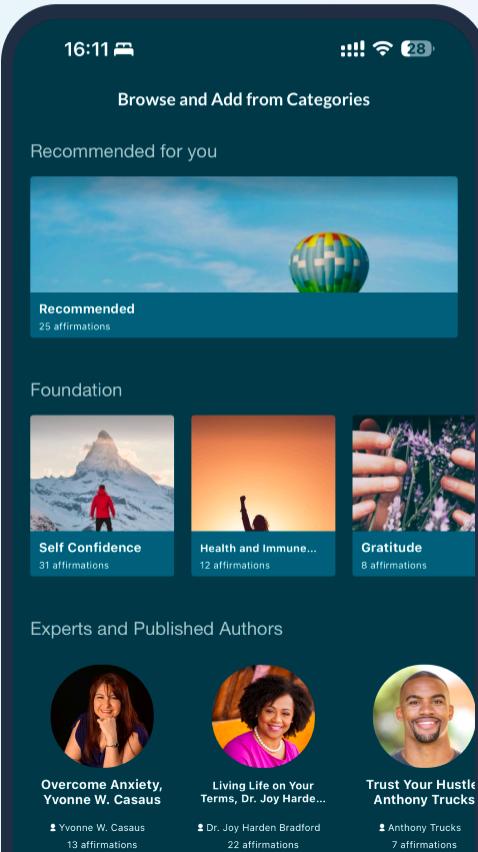
IS THE DARK MODE ONLY ABOUT DESIGN?





IS THE DARK MODE ONLY ABOUT DESIGN?

transitioning from light mode to dark mode results in way less battery consumption



NATIVE VS CROSS-PLATFORM



NATIVE VS CROSS-PLATFORM



**SWIFT IS 40% MORE
ENERGY-EFFICIENT THAN
DART AND 60% MORE SO
THAN JAVASCRIPT**

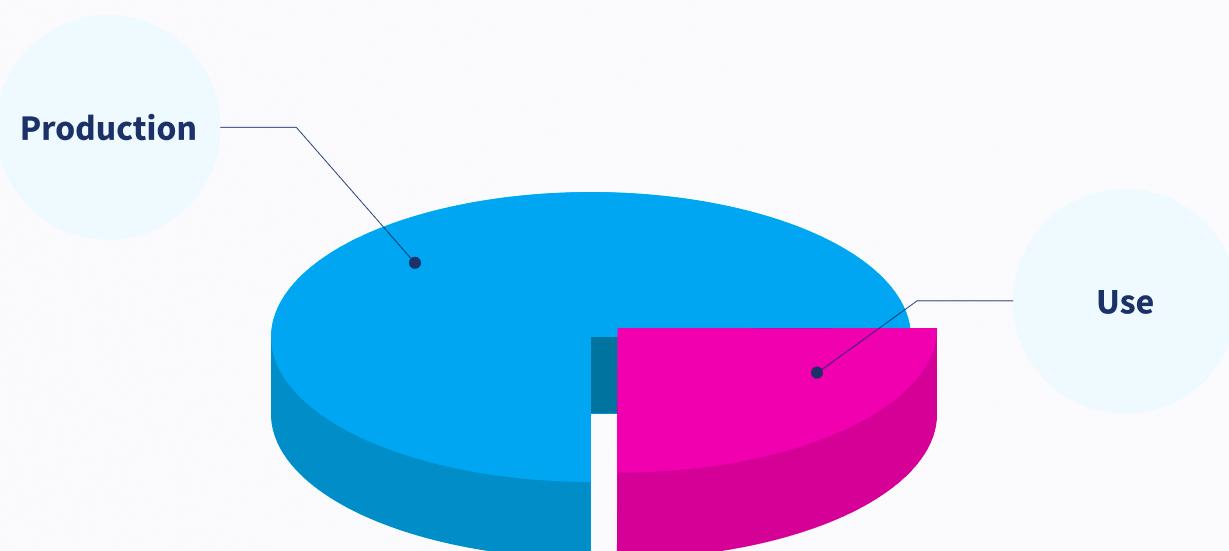


[PDF RESEARCH LINK](#)



THE MANUFACTURING AND DISPOSAL OF DEVICES RESULT IN CARBON EMISSIONS



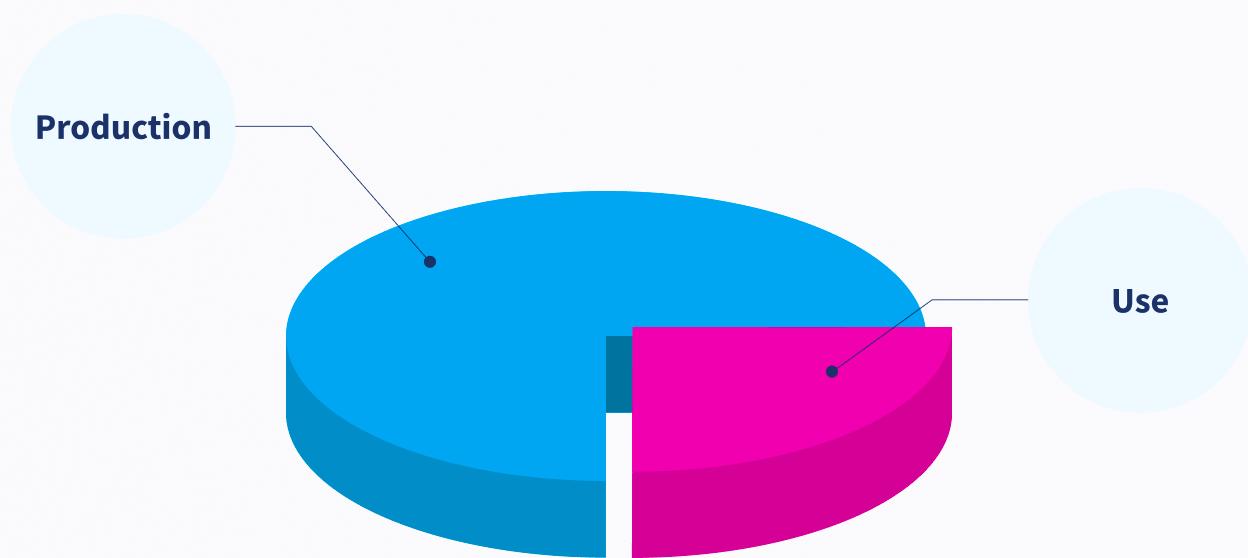


Production

Use

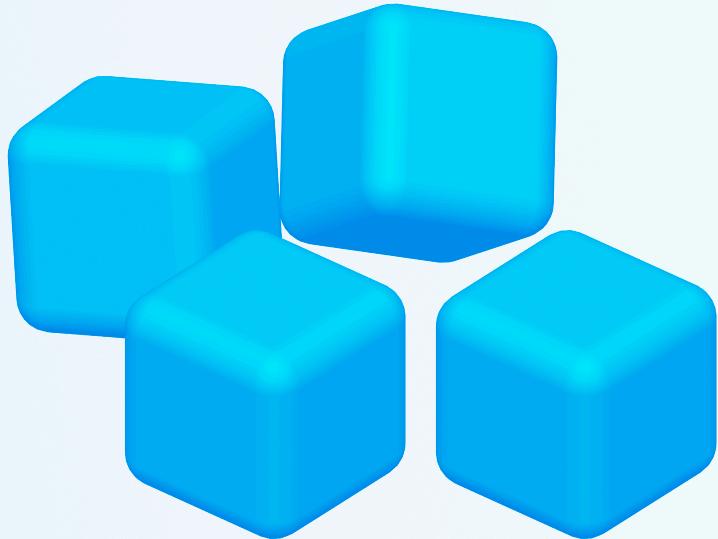
According to the Green Software foundation

**TO BE CARBON EFFICIENT WE NEED
TO BE HARDWARE EFFICIENT AS WELL**



According to the Green Software foundation

WHAT YOU **CAN'T MEASURE**,
YOU **CAN'T IMPROVE**



THE GHG PROTOCOL DIVIDES EMISSIONS INTO THREE SCOPES



Carbon emitted per kWh of energy, gCO₂/kWh

Functional Unit; this is how software scales, for example per user or per device

$$\text{SCI} = ((E * I) + M) \text{ per } R$$

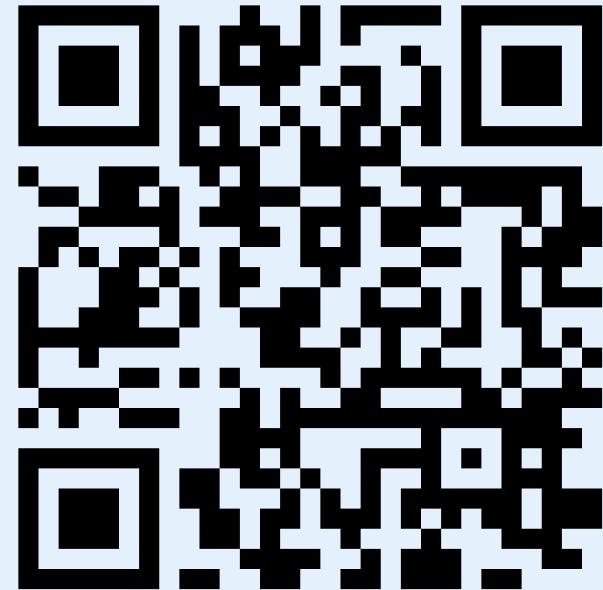
Energy consumed by software in kWh

Carbon emitted through the hardware that the software is running on

TO CALCULATE YOUR SCI SCORE, YOU MUST:



- ◆ Identify the components to incorporate
- ◆ Choose the functional unit
- ◆ Establish the approach for emissions measurement



SCI SPECIFICATION LINK

XCODE DEBUGGING GAUGES & INSTRUMENTS



**BUILDING SUSTAINABLE
SOFTWARE OFTEN COSTS NO
MORE THAN NON-SUSTAINABLE
DEVELOPMENT**



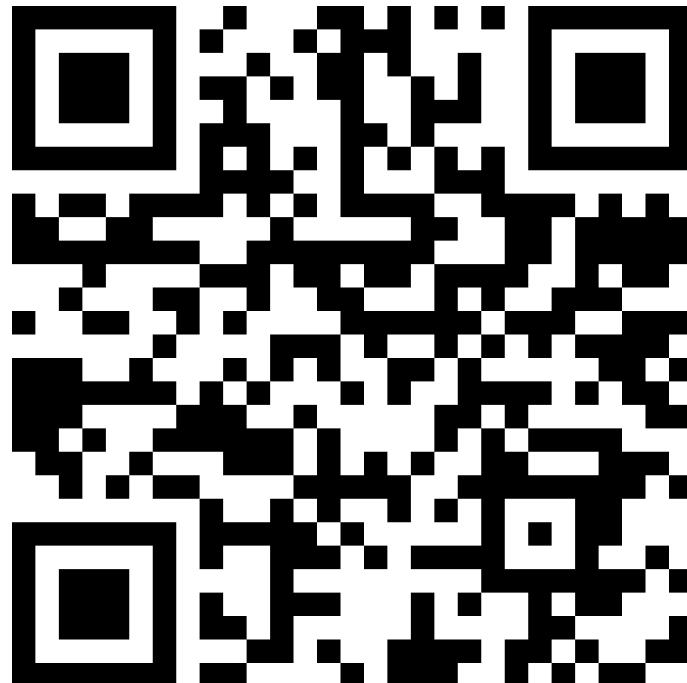
**BY FOCUSING ON
SUSTAINABILITY IN YOUR MOBILE
DESIGN, YOU CAN REFINE YOUR
TACTICS AND STRATEGY**



AWESOME GREEN SOFTWARE



Tooling, Organisations and
Academic Reading



GITHUB LINK

**THANKS FOR YOUR
ATTENTION!**

